The New Zealand

Journal of Agriculture.

VOL. 50. WELLINGTON, 21ST JANUARY, 1935. No. 1.

RUAKURA PIG-RAISING INVESTIGATION.

REPORT ON CONSIGNMENT OF PORKER PIGS.

T. E. RODDA, Manager, Ruakura Farm of Instruction, Hamilton.

AT Ruakura Farm in 1933, for the purpose of obtaining information about the breeds and breed-crosses capable of producing carcasses of suitable type, a number of pigs were bred and raised to porker weights and forwarded as dressed carcasses to England, where they were reported upon by Mr. Jos. B. Swain, of the Empire Pork House, and Mr. H. R. Davidson and Dr. John Hammond, of the School of Agriculture, Cambridge University, England.

No attempt was made in the raising of the pigs to throw light on any aspect of the feeding of pigs.

The pigs utilized, twenty in number, were born at various dates from the 22nd May to the 2nd July.

All animals were weighed periodically to ascertain how they were progressing. The first ten to reach the requisite weight were forwarded on the 3rd November to the Horotiu Freezing-works, where they were killed and dressed the following day, and placed in the freezing-chamber. The balance were killed and placed in the chamber as they became ready, the last two being killed on the 22nd November. On the 23rd November an examination was made of all the carcasses placed side by side on the rail at Horotiu. All these carcasses, excepting one (a Berkshire - Large White), were graded "prime" quality. Seven carcasses were definitely overweight and could not be included in the number to be forwarded in the trial. A selection was then made of the types we considered most suitable, so as to have four pigs in each pure breed or crossed breeds. Unfortunately, we were unable to get four carcasses for the Berkshire - Large White cross. Two only were included.

No attempt has been made to summarize or condense the overseas reports which are given below, and which are especially informative not only in respect to the comparative figures which they contain, but also in respect to the methods adopted in obtaining the data on which the reports are based.

Because of the comments in the reports regarding the Berkshire pigs, it is of some interest to note these pigs were produced by crossing English Berkshire sows with a Canadian Berkshire boar.

The accompanying photographs valuably supplement the data and findings of the reports.

The following are the particulars of the selected carcasses :—

Breed of Pig.	Tattoo No.	Number in Litter.	Number reared.	Average Weight at Weaning.	Live Weight (Full Fed).	Dressed Weight (Heads on).	Age when killed.	
				lb.	lb.	lb.	Weeks.	Days.
Tamworth × Large White	3	13	12	39·02	125	81	19	1
	4	14	13	33·46	119	77	20	3
	5	13	12	39·02	128	80	19	1
	8	13	12	39·02	119	76	19	1
Tamworth × Berkshire	17	14	13	37·2	115	77	18	5
	20	13	12	34·6	117	78	19	2
	21	13	12	34·6	119	77	19	2
	30	13	12	34·6	113	75	19	6
Berkshire	12	8	4	26·4	113	77	24	2
	26	11	10	39·22	115	76	20	1
	31	11	10	39·22	117	73	21	2
	32	11	10	39·22	114	73	21	2
Large White	14	6	5	43·50	118	73	18	6
	15	6	5	43·50	123	80	18	6
	16	6	5	43·50	120	78	18	6
	19	6	5	43·50	119	74	18	6
Berkshire × Large White	27	9	8	31·03	116	75	21	2
	29	9	8	31·03	115	75	21	6
Totals ..	..	..	..	..	2,125	1,375	..	

Report of Mr. Jos. B. Swain.

A considerable variation is noticeable in the marks awarded to each group of pigs, and it is interesting to note the Berkshire should have gained the largest average number of marks, although they are closely followed by the Berkshire - Large White cross. (Table 1 contains detailed data.)

In view of the conformation of the purebred Berkshire, it would be interesting to know if they are from a Canadian strain, as they do not appear to follow the usual contour of the English Berkshire. Carasss No. 12 is a very good type, although the legs are too long, and the hams tend to fall away, and the carcass is slightly wrinkled. Although great improvement is noticeable in the finishing and dehairing of pigs of this colour, great care must still be exercised if they are to compete successfully with a White pig.

The pure Large Whites are not very satisfactory, except for No. 14, which could have done with better legs, hams, and belly, neither were the Tamworth-Berkshires very satisfactory. Curiously enough, while I have been writing this report I have had a visit from an Australian farmer (New South Wales) who is using a (Canadian) Berkshire × Tamworth cross, using the Tamworth boar, and he said he was getting good results.

By incorporating the legs in the photographs, much useful information can be obtained about the surplus fat on some of these carcasses compared with the amount of meat.

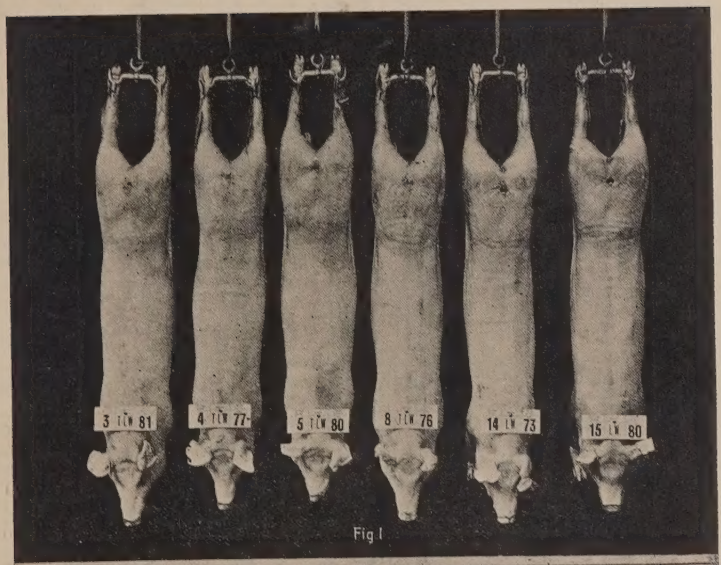
3 T-LW. 81
4 T-LW. 77
5 T-LW. 80
8 T-LW. 76
14 LW. 73
15 LW. 80

Fig. 1

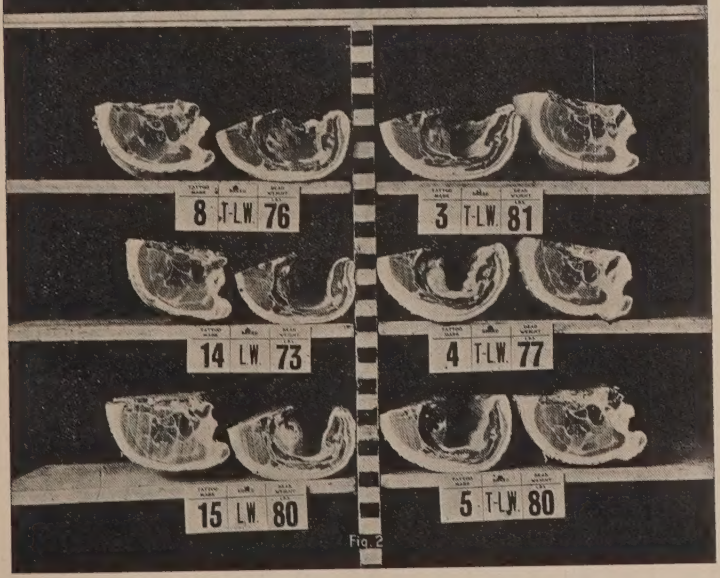
8 T-LW. 76
3 T-LW. 81
14 LW. 73
4 T-LW. 77
15 LW. 80
5 T-LW. 80

Fig. 2

Table 1.

Points and Requirements.	Maximum Marks.	Tamworth × Large White.				Large White.				Tamworth × Berkshire.				Berkshire.				Berkshire × Large White.	
Carcass number	..	3.	4.	5.	8.	14.	15.	16.	19.	17.	20.	21.	30.	12.	26.	31.	32.	27.	29.
Carcass weight (in pounds)	..	81	77	80	76	73	80	78	74	77	78	77	75	77	76	73	73	75	75
A. Dressing and general appearance, including finish—																			
Long-bodied, clean, well dehaired, white-finished carcasses. Thin skin	15	6	6	8	6	10	8	8	6	8	10	9	8	7	7	9	10	7	8
B. Hind-leg bone—																			
Length from aitch-bone to foot, in inches	8	19 7/8	19 1/8	19 1/4	19 1/2	20	19 1/2	19 1/8	19 3/8	18 1/4	18 1/8	16 3/4	18	19	17 5/8	17 1/8	17 13/16	18 3/4	17 7/8
		6	6	6	5	5	6	6	5	7	7	7	6	6	7	7	7	6	7
Length per pound of carcass, in inches (expressed in decimals)		·245	·248	·240	·256	·274	·244	·245	·261	·237	·232	·217	·240	·245	·231	·234	·244	·250	·238
C. Hams—																			
Well-rounded and well-covered with fat ..	9	4	4	5	4	6	7	7	5	7	8	8	8	6	8	8	6	6	7
D. Loin—																			
1. Length from aitch-bone to first rib, in inches	10	29 7/8	29 3/8	29 3/4	29 7/8	29 15/16	29 5/8	29 1/8	29 3/4	28 1/4	28 3/8	28 1/4	28 5/8	28 3/4	28	27 3/4	27 3/4	30	27 7/8
		7	7	7	8	9	7	7	8	6	6	6	7	7	6	5	5	8	6
Length per pound of carcass in inches (expressed in decimals)		·368	·381	·371	·393	·410	·370	·373	·402	·367	·363	·367	·381	·373	·368	·380	·380	·400	·388
2. Large eye of meat	12	4	3	5	6	9	5	10	5	7	6	8	8	11	9	8	10	7	7
3. Covering of fat on loin near kidney 60–80 lb., 3/4 in.; 81–100 lb., 7/16 in.; 101–120 lb., 5/8 in.	13	5/8	3/4	9/16	7/16	3/8	1/2	15/32	7/16	9/16	5/8	9/16	1/2	3/8	15/32	7/16	7/16	11/32	15/32
		5	3	6	11	12	7	8	10	6	4	6	7	13	8	10	10	12	8

Table 1—continued.

Points and Requirements.	Maximum Marks.	Tamworth × Large White.				Large White.				Tamworth × Berkshire.				Berkshire.				Berkshire × Large White.	
Carcass number	..	3.	4.	5.	8.	14.	15.	16.	19.	17.	20.	21.	30.	12.	26.	31.	32	27.	29.
Carcass weight (in pounds)	..	81	77	80	76	73	80	78	74	77	78	77	75	77	76	73	73	75	75
E. Belly— Compact, not too much leaf, well streaked with lean, reasonable proportion of fat	15	12	6	10	10	6	11	8	9	8	7	9	9	11	9	9	10	10	10
F. Shoulder— Compact blade-bone well set in, the whole tapering towards small neck. Meaty hand with fine short bone	13	9	4	9	6	9	9	9	10	7	5	8	9	11	9	8	10	10	8
G. Head— Small in size in proportion to size of carcass	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Total	100	57	43	60	60	70	64	67	62	60	57	65	66	76	67	68	72	70	65
Average marks	..	55				$64\frac{3}{4}$				62				$70\frac{3}{4}$				$67\frac{1}{2}$	

REPORT BY H. R. DAVIDSON, ESQ., M.A., AND DR. JOHN HAMMOND, F.R.S., OF THE SCHOOL OF AGRICULTURE, CAMBRIDGE.

H. R. Davidson, Esq., M.A.—These eighteen carcasses were examined in Smithfield Market on the 9th March, 1934, and graded on the same basis as previously. No records were available of weaning figures, age, or food consumption. With the exception of No. 4, which was too fat and at the same time underdeveloped in the lean, and possibly of No. 27, which seemed to be slightly abnormal in conformation, the carcasses were all very good indeed, and nearly all superior to prize-winning entries in carcass shows in this country. The remaining pigs graded second class were so placed after very close examination.

As the weights varied only from 73 lb. to 81 lb., it was possible to make close and useful comparisons on a breed basis, this being the only factor on which information was available. While only a very small number of animals is involved in each breed or cross, the differences may be useful for comparison with other results. Only measurements have been used in the following analysis, but a comparison of the photographs with the grades given on eye inspection will show that the measurements are almost always in accord.

Of the four measurements taken, one, the thickness of the back fat, has an optimum dimension, and so is difficult to use for comparative purposes. In the case of the other three, however, quality may be considered as improving according as the dimension increases or decreases without limit. These are the length of back, length of fore foot (trotter) and thickness of loin muscle. In the table they are first of all compared on a standard basis of 100 lb. carcass weight, and then their relationships to each other are set out.

The figures used (Table 2) are the weighted averages for all the individuals in each breed or cross.

Table 2.

—	Tamworth × Large White.	Large White.	Tamworth × Berkshire.	Berkshire.	Berkshire × Large White.
$\frac{\text{Length}}{\text{Weight}} \times 100$ ..	33·0 in.	34·6 in.	32·9 in.	33·5 in.	35·2 in.
$\frac{\text{Forefoot}}{\text{Weight}} \times 100$ ..	5·04 in.	5·10 in.	4·77 in.	4·82 in.	5·27 in.
$\frac{\text{Loin muscle}}{\text{Weight}} \times 100$ ..	1·93 in.	2·14 in.	2·22 in.	2·40 in.	2·02 in.
$\frac{\text{Average length to weight}}{\text{Average trotter to weight}}$	6·55	6·79	6·89	6·95	6·67
$\frac{\text{Average length to weight}}{\text{Average loin muscle to weight}}$	17·2	16·3	14·8	14·0	17·4

From this it will be seen that four Berkshire pigs are on the whole superior to the others, and they are so because they lack those faults which are typically associated with the breed in this country. Probably the shortest breed in Great Britain, they are only third out of five groups as regards length. Then while in this country they are often much too fat, the only one (No. 12) to be faulted in grading on this

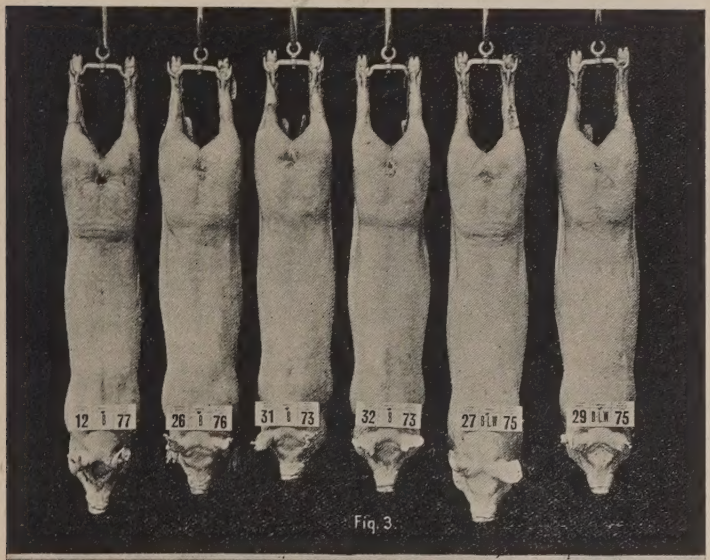
12 B 77
26 B 76
31 B 73
32 B 73
27 B-L.W. 75
29 B-L.W. 75

Fig. 3.

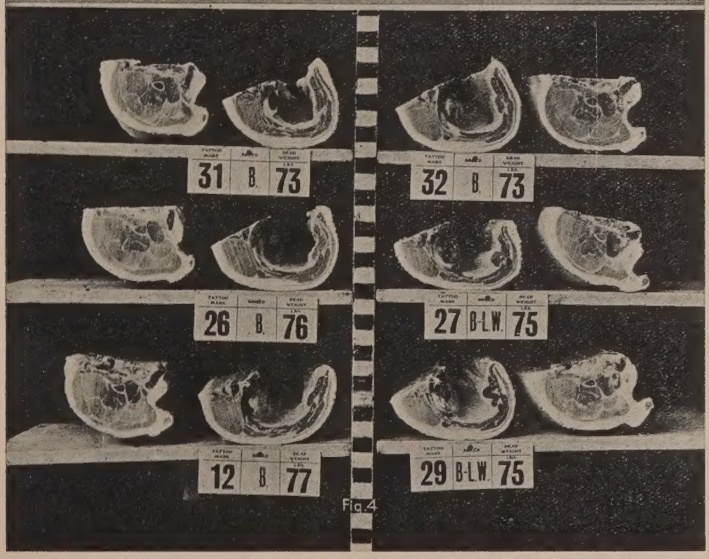
31 B. 73
32 B. 73
26 B. 76
27 B-L.W. 75
12 B. 77
29 B-L.W. 75

Fig. 4.

occasion is actually too lean. The proportionate length of the trotter to weight is recognized as being an index of early maturity, and in this respect the Berkshire pigs come second in the list. Early maturity, however, is often also associated with early fattening and for small London pork this is to be avoided. The Tamworth-Berkshire cross pigs have the shortest trotters, but they have more fat and less lean. They are also noticeably short in comparison with the other groups, having the poorest figure of all five in this respect. When, therefore, one takes the ratio of trotter length per 100 lb. to length per 100 lb., it is found that the Berkshire comes out top. That is to say, that they combine the length of back required with the early maturing properties which are usually associated with shortness of body. Of still greater interest is the comparison of loin muscle per 100 lb. to length per 100 lb. because the loin-muscle measurement is the true commercial index of early maturity. Here again the Berkshire is first, but while its superiority in the case of trotter to length is only 1 per cent., it is, in the case of loin muscle to length, in the neighbourhood of 6 per cent.

On the other hand, the Tamworths involved do not come well out of the investigation. While they have, when crossed either with the Berkshire or Large Whites, noticably reduced the proportion of trotter, they have also still more reduced the length. In this case the reduction of trotter has not been accompanied by a commercial form of early maturity for the measurement of loin muscle has been considerably reduced as well, and the proportion of this to length is poorer than in the pure breeds.

The two pigs of the Berkshire - Large White cross have not given good results, but No. 27 does not seem to be a very typical pig, and it is hardly fair to draw conclusions from so small a number.

As regards the grading generally, the following suggestions occur :—

No. 4 : Probably a bad type of pig (a genetic factor). The lean is underdeveloped, yet the large amount of fat shows that there has been no unthriftiness.

No. 14 : A good pig killed just a little too light. While the Large White can make very good pork, it should usually be killed a trifle heavier than the other breeds.

No. 19 : The same remarks apply here. Both of these pigs are 73 lb., the lowest in the weight range, whereas they ought to have been killed at about 81 lb., the weight of No. 3.

No. 12 : This is a somewhat peculiar type, being almost a rangy type of Berkshire with very small fat development.

No. 27 : A cross pig with the faults of both parents rather than their virtues. This is one of the great dangers of cross-breeding not always fully appreciated.

Dr. John Hammond, F.R.S.—They were all good and criticism only is directed to finer points of production to differentiate between the carcasses.

They were remarkable for the thickness of lean meat on the loin.

The sets seem to show that first-class porkers can be produced from almost any breed or cross provided the feeding is right—as was the case with these, for they were almost all well developed in the lean meat and had the right proportion of fat.

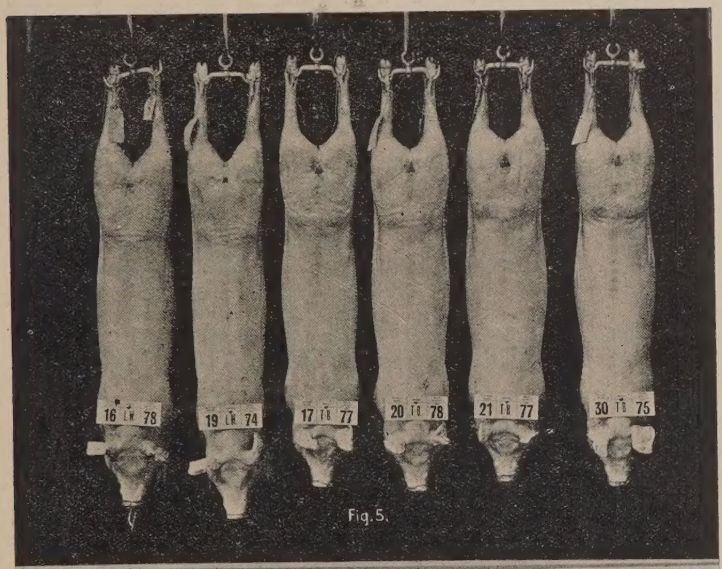
16 LW 78
19 LW 74
17 TB 77
20 TB 78
21 TB 77
30 TB 75

Fig. 5.

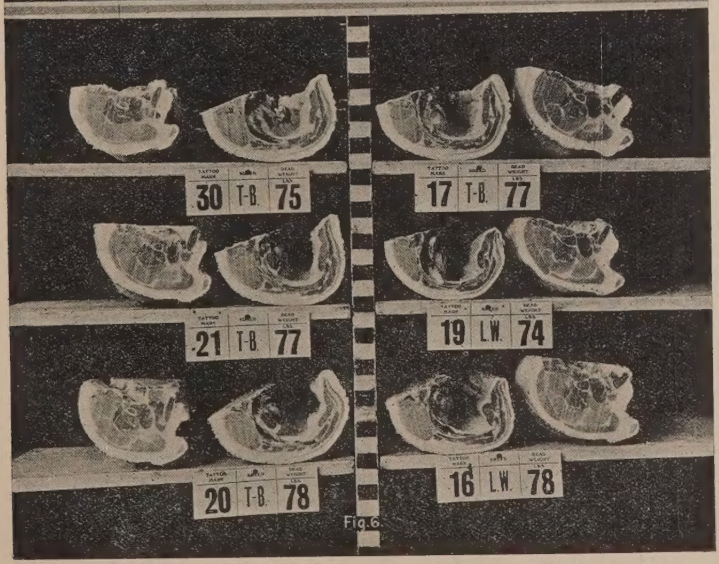
30 T-B. 75
17 T-B. 77
21 T-B. 77
19 LW. 74
20 T-B. 78
16 LW. 78

Fig. 6.

Table 3.—Report on Eighteen Porker Pigs from Ruakura Government Farm.

Tattoo-mark	3.	4.	5.	8.	14.	15.	12.	26.	31.	32.	27.	29.	16.	19.	17.	20.	21.	30.
Breed	T. × L.W.	T. × L.W.	T. × L.W.	T. × L.W.	L.W.	L.W.	B.	B.	B.	B.	B. × L.W.	B. × L.W.	L.W.	L.W.	T. × B.	T. × B.	T. × B.	T. × B.
Weight (pounds) ..	81	77	80	76	73	80	77	76	73	73	75	75	78	74	77	78	77	75
Conformation (Ideal, Very Good, Good, Fair, or Poor)	V.G.	V.G.	V.G.	V.G.	G.	V.G.	G.	V.G.	G.	G.	G.	V.G.	V.G.	G.	G.	G.	G.	G.
Back—																		
Amount of fat: 2nd grade (rather fat or lean)	1	2 (fat)	1	1	2 (lean)	1	1	1	1	1	2	1	1	2	1	1	1	1
Eye of loin: 2nd grade	2	2	1	2	1	1	1	1	1	1	2	2	1	2	1	1	1	1
Streak—																		
Thickness: 2nd grade	1	1	1	1	2 (lean)	1	1	1	1	1	1	1	1	2	1	1	1	1
Composition: 2nd grade (rather fat or lean)	1	2 (fat)	1	1	2 (lean)	1	2 (lean)	1	1	1	2 (lean)	1	2 (lean)	2 (lean)	1	2 (fat)	1	1
Legs: 2nd grade ..	2	2	1	1	1	1	1	1	1	1	2	2	1	2	1	1	1	1
Final grade	1	2	1	1	2	1	2	1	1	1	2	1	1	2	1	1	1	1
Measurements—																		
Length of forefoot (centimetres)	10·5	9·8	9·7	10·2	10·3	9·8	9·2	8·7	9·5	9·2	1·00	1·01	9·5	1·00	9·5	9·2	9·1	9·5
Length of back (inches)	26·2	25·6	25·8	26·0	26·6	26·6	25·4	25·4	24·6	24·8	27·4	25·4	25·2	27·0	25·2	25·2	25·4	25·2
Thickness of back fat (centimetres)	1·6	2·1	1·6	1·5	1·1	1·5	1·3	1·5	1·4	1·3	1·2	1·4	1·5	1·3	1·6	1·9	1·6	1·6
Thickness of loin muscle (centimetres)	4·0	3·5	4·1	3·8	4·0	4·3	4·8	4·6	4·3	4·5	3·8	3·7	5·3	3·3	4·2	4·4	4·5	4·3
Ratio—																		
Length in inches / 100 × Weight in pounds	32·4	33·2	32·3	34·2	36·4	33·3	33·0	33·4	33·7	34·0	36·5	33·9	32·3	36·5	32·7	32·3	33·0	33·6
Ratio—																		
Trotter length (inches) / Weight (pounds)	5·10	5·00	4·78	5·29	5·55	4·81	4·70	4·50	5·12	4·96	5·23	5·31	4·80	5·31	4·86	4·64	4·65	4·98

Perhaps the exception to the above is in the external conformation of the ham, which is better in the Berkshire and Berkshire crosses than it is in the others, at these weights—although at heavier weights they would no doubt have lacked the length of back which is seen in the other breeds.

The Large White (No. 16) which was better in the external conformation of the leg was quite equal to the Berkshire and the Large White could be improved for porkers *at this weight* by paying attention to the point.

We unanimously place the five different breeds and crosses in the following order :—

(1) Berkshire.
(2) Tamworth × Berkshire.
(3) Large White.
(4) Tamworth × Large White.
(5) Berkshire × Large White.

NOTE.—The uniformity of the Berkshire group was spoilt by one pig (No. 12), but on the whole this group was the best.

SPECIAL NOTE ON PIG NO. 12.

In the reports from overseas there seems to be some discrepancy of opinion relative to pig No. 12. This pig was placed first by Mr. Jos. B. Swain, who says "Carcass No. 12 is a very good type, although the legs are too long and the hams tend to fall away and the carcass is slightly wrinkled." On the other hand, Messrs. Davidson and Hammond say this pig is too lean and "This is a somewhat peculiar type, being almost a rangy type of Berkshire with a very small fat development."

In view of these two opinions, the following comment was obtained from prominent representatives of the New Zealand pig industry :—

Mr. J. A. Russell, Gillespie's Line, Palmerston North, says "From a breeder's viewpoint, No. 12 on appearance shows lack of meat in twist and would be improved if fuller in the loin and of better finish at the elbow. There does not seem to be the depth of meat through the ham that I as a breeder would like to see. The cuts indicate a wonderful development of meat especially in the flank, and this has led to the prominent place given by Mr. Swain. This placing seems to contradict the former comment, but really it does not ; it strikingly provides a valuable illustration of the advisability of breeders paying more attention to the cuts—attention which marketing requirements will make essential with further development of the export trade. Breeders will have to adopt a system of breeding which will fix the type required to provide the suitable cuts."

Mr. C. Hausmann, managing director of the Fielding Bacon Co., Ltd., says,—

"With regard to the photographs of the porkers which were shown at Smithfield, and judged by Mr. J. B. Swain, and also the comments made by Messrs. Davidson and Hammond, I quite concur with Mr. Swain's remarks. In view of the fact that the legs are lengthy, the hams lacking finish, and a marked wrinkle displayed on the carcass, a little more finish was necessary to bring them to what one might term a state of perfection, but there would still be an element of danger that the cross-sections, as shown in the lower photographs, would in all probability have shown excessive fat. In my opinion, the right carcass has been chosen for that of first."

VINES FOR THE HOME GARDEN.

HOW TO PLANT THEM.

J. C. Woodfin, Vine and Wine Instructor.

The planting of grape-vines in New Zealand and the consumption of grapes could very beneficially be increased. This article deals with the planting of table-grape varieties in the domestic garden or the home vineyard.

A few vines to supply the household with table grapes can be grown in almost any garden which has a well-drained soil and which receives plenty of sunshine, and no very special knowledge is necessary to do this. Many people think that grape-vines are difficult to grow, or that the vine requires a hot climate or a glasshouse to ripen its fruit in. Actually grapes grow to perfection in temperate climates, and among the 5,000-odd varieties there are some that will ripen in almost any sunny spot in New Zealand.

Time of Planting.

The usual time for planting vines outdoors in New Zealand is during the month of August. There are two periods during which both vines and vine-cuttings can be planted successfully. In open well-drained soils it is an advantage to plant them in the autumn, when the vines are losing their leaves; they will then start forming roots almost at once, and be in good condition to make an early start in the spring. On soils that are liable to be wet in the winter, the vines and cuttings should be planted in the spring, when the ground begins to become warm again.

Use of Suitable Stocks.

In Auckland City and throughout the Auckland Peninsula it is essential to plant vines that have been grafted on Phylloxera-resistant stocks, as this destructive insect is spread over most of that part of the country. In fact, as the insect is liable to spread southwards it is a useful precaution to plant vines on resistant stocks in adjoining districts. The outlay for grafted vines is, of course, considerably greater than for cuttings. Grafting vines on suitable stocks improves the setting of shy-setting varieties and increases the crops of most varieties. It is important, however, that the right stocks should be selected. They should have perfect affinity for the scion or fruiting part of the vine and be adapted to the soil conditions of the district in which they are to be planted. There are a number of stocks in use, all of American origin, and they differ, some of them very considerably, in their individual soil requirements.

Selection and Preparation of Land.

Table grapes can be grown successfully on flat land if it is well drained, and as size and appearance are generally demanded the soil may be richer than that required for wine grapes. Soils rich in food for grapes are not necessarily those which are considered rich for general cropping purposes, as a survey of the actual vineyards in this

country would prove. A poor soil to which the lacking constituents can be added is better than an over-rich soil for vines. The most important centre of table-grape production in New Zealand is in the Waikato, at Te Kauwhata, where the vines are grown on a stiff clay with very little top soil, but, notwithstanding these conditions, the vines produce heavy crops of handsome and luscious fruit, the result of sunshine and careful treatment, for no fruit responds to careful treatment so well as the grape.

Where there is a choice of situation, a gentle slope facing the north-east, north, or north-west should be preferred, in that order, for planting the vines, and if they are being planted in rows the rows should run from north to south where the lay of the land permits.

Before planting the vines the soil should be thoroughly worked, so that the roots will be free to spread rapidly through the soil in all directions. When the roots have started to grow, deep cultivation should be abandoned, as it would destroy the roots and rootlets, which in New Zealand are generally to be found within a few inches of the surface.

On compact subsoils having little topsoil the topsoil should be turned to a depth of 8 in. to 10 in. and the plough followed along the furrow by another plough without a mould-board to subsoil it another 4 in., or one plough with a subsoiling attachment may be used. Where the soil is of the same quality to some depth and is well drained, a deep ploughing will suffice.

When the ground is covered in grass it should be skim ploughed in the autumn, and ploughed deeply across the direction of the skim furrows in early spring before the final cultivation.

It will give the vines a good start and feed them for some time afterwards if about 5 cwt. or 6 cwt. of bone-meal per acre, or 2 oz. per square yard, is applied to the surface soil before turning it in. No other manure should be applied when planting.

Vine-roots develop best in newly-turned-in surface soil, and for this reason it is preferable to plough a couple of inches more deeply than it is intended to plant the vines. After ploughing, the ground should be worked to a fine tilth as it is for sowing cereal crops. The same principles which apply to ploughing apply also to spade work in the garden. In soils lacking in humus, blue lupin may be sown in the year preceding planting at the rate of 100 lb. of seed, with 1 cwt. of superphosphate, to the acre, and turned in when in flower.

Planting.

For single vines a hole a yard in diameter and 1 ft. deep should be dug out and the bottom filled with a mixture of topsoil and bone-meal.

If it is intended to plant cuttings, these should be selected from medium-sized, well-ripened canes of the season's growth, discarding the immature wood from the thin ends. A single eye cut with $\frac{1}{2}$ in. of wood, placed in the soil like a seed, will grow into a vine if the soil is kept moist; but for general planting it is usual to cut lengths of cane from 6 in. to 10 in. long, though cuttings of a foot or even 18 in. long may be required in very open or gravelly soils liable to

dry out to a considerable depth in the summer. If the cuttings are to be planted in the spring, the wood can be left entire and buried in dry sand in a cool sheltered place until wanted for planting, when it should be cut into suitable lengths and placed upright in water for forty-eight hours before planting. This same treatment is applied to both cuttings and rootlings received from outside sources. When not required for immediate planting the cuttings or rootlings should be buried under a little moist soil in a shady spot.

To prepare vine cuttings for planting the bottom node or joint is cut through below the bulge, and 2 in. of wood left above the top

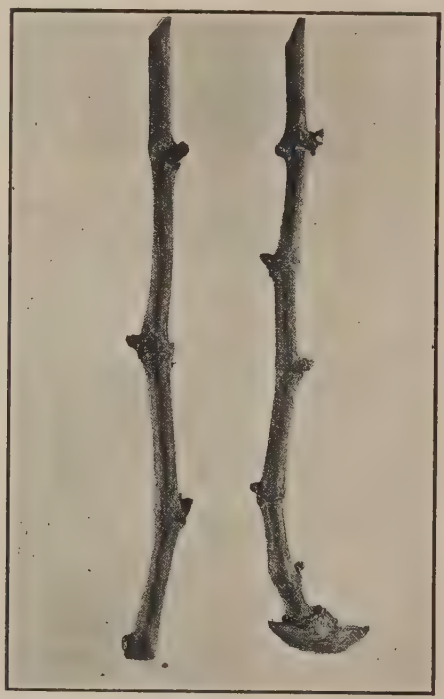

FIG. 1. VINE CUTTINGS PREPARED FOR PLANTING.

node. Most of the roots will grow from the bottom of the cuttings. Any found growing within 3 in. or 4 in. of the surface should be cut off close to the stem during the two winters following planting.

The cuttings can be planted either directly in permanent position or in a nursery about 4 in. apart; in either case extra cuttings should be planted to replace failures.

To plant vine-cuttings in prepared ground a hole should be made for each with a dibble or crowbar, and the cuttings inserted so that the top bud is level with the surface of the soil. Then insert the

dibble in a slanting direction towards the foot of the cutting and lift the earth towards it. Repeat this operation from two other points. It is essential that no air spaces should be left round the cutting, as moulds are apt to form in them and cause decay. When the soil is dry, water poured into the hole containing the cuttings will moisten

FIG. 2. A CLEFT-GRAFTED VINE ROOTLING BEFORE TRIMMING PREVIOUS TO PLANTING.

FIG. 3. THE SAME VINE AS IN FIG. 2, TRIMMED.

the soil and at the same time help to pack it. Now place a 2 ft. stick about 9 in. in the ground to act as a support to the young vine, and form a mound of friable soil to cover the 2 in. of wood above the bud. This will retard the growth from the bud, which is liable to get ahead of the root growth and dry out the cutting before the roots can supply any sap.

In choosing grafted rootlings care should be taken to select only those with perfect unions. A flaw in the union permits soil bacteria and fungi to enter into and eventually destroy the vines, often after five or six years' apparently healthy growth.

To prepare grafted vines for planting, all shoots except the strongest one are cut off, and that shoot is left intact. This is important. All the roots excepting the bottom ones are then trimmed off, leaving mere stubs of these latter $\frac{1}{4}$ in. in length, and the vines are planted in the same manner as the cuttings, but with the lower extremity of the union 2 in. above the ground-level. The vine is then staked and a mound of earth thrown up to cover the union and 4 in. of the scion above it, so as to allow for the earth settling

FIG. 4. AN UNPRUNED VINE.

down. The two lower buds on the shoot should be covered with the soil. It is essential that the union should be kept protected from the drying effect of the air until the end of summer.

Care after Planting.

When the leaves on the two or three top buds of the shoot which was left on the vine have opened out, the earth is drawn away and the shoot cut down to one or two buds above the base bud, after which the earth is replaced over the vine. The soil should be kept in good tilth and free from weeds. One shoot only should be allowed to grow, and that secured to the stake, leaving room in the tie to allow the vine to develop. The tender growths of the young vines are very susceptible to fungous diseases, and should be protected accordingly. A special bulletin on the control of vine-diseases is obtainable from the Department.

In the early summer the soil should be drawn away from the unions, and roots on the scions and suckers on the stocks cut away. The soil should be then replaced, to be finally removed when the summer heat is declining.

When the vines are planted in rows, a distance of from 8 ft. to 16 ft., according to the vigour of the variety, is left between the vines, and 6 ft. for hand work, or 8 ft. to 10 ft. to allow for horse or motor power, is left between the rows.

Table-grape vines are generally grown on a trellis, the bottom wire of which is 18 in. above the soil; 12 in. above that wire are two wires 18 in. apart, and 18 in. above these two another single wire. Vines can also be trained over pergolas or against a wall.

Another method is to grow a number of rods from the main stem and support them 2 ft. from the ground on forked sticks.

FIG. 5. A SPUR-PRUNED VINE.

Selection of Varieties.

In choosing suitable varieties to grow in a particular district the consideration of the latitude is not so important as that of the altitude and aspect. For instance, it has been noticed that certain varieties ripen a fortnight earlier on favourable sites in Central Otago than on less favourable sites in the Wairarapa. In Te Kauwhata, where the principal table grape grown is the Albany Surprise, there is a difference of from three weeks to a month in the ripening of this variety on sites of different aspect.

The vines of the first four periods mentioned below will ripen their grapes in the most southerly parts of the South Island if grown on sites protected from the south and exposed to the sun.

RIPENING PERIODS.

The "first" ripening period is that of the Golden Chasselas (Chasselas doré de Fontainbleau), which ripens in New Zealand about the end of February or the beginning of March, according to the

altitude, aspect, and soil conditions of the vineyard. The "precocious" varieties ripen their fruit from two to three weeks before the Golden Chasselas; "early" varieties between the "precocious" and "first" period varieties; "second" and "third" periods approximately two and four weeks later respectively than the Golden Chasselas.

European Varieties for Outdoor Culture.

The following are the table-grape varieties recommended for outdoor culture in New Zealand:—

Precocious Period.—Black: Gamay hâtif des Vosges; Madeleine Noir. White: Madeleine Alice Salomon; Luliatica Pavese; Moscato Bianco Precocissimo.

Early Period.—Black: Noire hâtif de Marseille. White: Précoce de Malingre; Agostenga.

Early First Period.—Black: Portugais bleu. White: Madeleine Royale; Goldriesling blanc; Chasselas Vibert; Ferdinand de Lesseps.

First Period.—White: Golden Chasselas (Salomon's selection); Sicilien (syn. Panse précoce); Lignan. Rose: Chasselas Rose (Salomon's selection); Chasselas Rose Royale.

Second Period.—Black: Black Hamburg; Muscat Caillaba; Cinsaut (syn. Boudales). White: Bicane (grafted on 34 Ecole); Gradiska; Temprano; Foster's seedling; Muscat de Frontignan; Poulsart blanc; Palomino. Red: Muscat rouge de Madère. Rose: Superbe de Candole.

Late Second Period.—Black: Muscat Hambro (grafted on 34 École). White: Regina.

Third Period.—Black: Black Alicante; Mrs. Pince's Muscat; Gros Maroc; Malakoff Isjum. White: Golden Queen; Vigne de Michel; Shiradjouli; Blanc de Calabre; Rosaki; Corniola de Milazzo; Muscat of Alexandria. Red: Maraville de Malaga; Red Hanepoot.

American and American-European Varieties.

The pure American varieties and American-European hybrids, being more resistant to diseases, are especially suitable for North Auckland conditions, and as they require less care than the European varieties are very suitable for planting in the farmer's garden or orchard.

Owing to their aromatic flavours, the grapes they bear are not always appreciated by those used to the delicate flavours of the European grapes; but others prefer them, as the already large and increasing demand for the Albany Surprise on the Auckland market and for the Iona in Hawke's Bay goes to prove.

Precocious.—White: Baco 2–16 (Totmur) suitable for pergolas.

Early.—Black: Campbell's Early; Worden. White: Seibel 5279; Diamond.

First Period.—White: Seibel 2653; Seibel 4995; Seibel 5860; Gaillard Girerd 157; Baco 7A.

Late First Period.—Black: Seibel 4643; Seibel 5455. Red: Agawam.

Second Period.—White: Niagara. Black: Albany Surprise—suitable for pergolas; Herbert; Concord; Seibel 5813. Red: Iona; Brighton.

Smaller Collections.

A smaller collection, selected from both European and American varieties, that would supply grapes throughout the season could consist of the following :—

Black : Noir de Marseille ; Portugais bleu ; Black Hamburg ; Muscat Caillaba ; Albany Surprise ; Cinsaut ; Muscat Hambro ; Gros Maroc ; Mrs. Pince's Muscat.

White : Madeleine Alice Salomon ; Madeleine Royale ; Seibel 5279 ; Chasselas Vibert ; Golden Chasselas (Salomon's selection) ; Sicilien ; Seibel 2653 ; Foster's seedling ; Gradiska ; Temprano ; Golden Queen.

Red : Chasselas Rose Royale ; Muscat Rouge de Madère ; Iona ; Red Hanepoot.

A still smaller selection suitable for both home and market purpose could include :—

Black : Portugais bleu ; Seibel 4643 ; Albany Surprise ; Black Hamburg ; Cinsaut.

White : Madeleine Royale ; Seibel 5279 ; Chasselas Vibert ; Seibel 2653 ; Golden Chasselas ; Golden Queen.

Red : Chasselas Rose Royale ; Iona.

A number of recently introduced varieties of American, European, and hybrid vines are under observation in the Government Experimental Vineyard at Te Kauwhata, and will be released during the next and following seasons as they are found to be suitable for New Zealand conditions.

Phylloxera-resistant Vine-stocks.

A selection of stocks suitable for the various types of soil in the Phylloxera-infested areas of North Auckland is available. Advice as to their affinity for scion varieties and their adaptation to the different soils will be supplied on application. With a good start rooted vines will produce grapes in the second season after planting, and cuttings in the third season.

Control of Bronze Beetle.—There is a minimum amount of arsenate-of-lead deposit required for effective control of bronze beetle, and investigations with spreaders showed that these materials, while increasing the evenness of the film, were very prone to run too much spray off the fruit. The most effective type of cover that could be secured by spraying was a close " spot " one applied with a fine mist spray using acid arsenate of lead alone. Work with fish-oil and arsenate did not uphold previous results because the oil also ran too much arsenate off the fruit. Paris green gave a better killing effect on the beetle than did the same quantity of arsenate of lead, but the former material is very liable to cause injury. Barium fluosilicate gave approximately the same control as did arsenate of lead, but it too caused severe burning of the fruit. The conclusion reached in this work as far as spraying is concerned is that a good, even " spot " cover of arsenate of lead applied as a mist spray will give a good control, and where the beetle is troublesome it is advisable to endeavour to secure such a cover with 4 lb. of acid arsenate of lead per 100 gallons of spray.—*Report, Entomologist.*

WINTON EXPERIMENTAL AND DEMONSTRATION FARM.

RECORD OF WORK FOR SEASON 1933–1934.

A. STUART, Instructor in Agriculture, Fields Division, Invercargill.

THE 1933–34 season, apart from a dry period of six weeks' duration from the beginning of November, was quite favourable for dairying operations, but until nearing the end of the season the price of cheese was exceptionally low. Butterfat actually sold amounted to 10,682 lb., which is equivalent to a per-acre production of 117·38 lb. From the group herd-testing figures it was ascertained that the 43 cows placed under test averaged 257·51 lb. In comparison with the previous year there has been a big improvement in total production, but it is hoped to obtain a similar improvement in per-cow production, especially as the herd is being reduced to enable some sheep to be carried with profitable results.

ROTATIONAL GRAZING INVESTIGATIONS.

A rotational grazing trial, originally laid down in 1928, was associated with an investigation into the merits or demerits of using continuous applications of sulphate of ammonia in addition to phosphate (see *Journal of Agriculture*, Vol. 41, pp. 407–412, for particulars as to the establishment of this trial). Last season each field which had received the sulphate of ammonia dressings was top-dressed with 2 cwt. per acre of carbonate of lime for each hundredweight of sulphate of ammonia applied between 1928 and 1932.

The records of carrying-capacity during the season were as follow :—

Field.	Cow-days.	Dry-stock Days.	Total.
4A	219·3	91·2	310·5
4B*	175·6	86·8	262·4
Difference ..	..	..	48·1
8A	236·2	115·8	352·0
8B*	180·5	92·2	272·7
Difference ..	..	..	79·3
10A*	277·5	121·4	398·9
10B	241·9	136·1	378·0
Difference ..	..	..	20·9

* Denotes under nitrogen previously.

From the above it will be noted that the carrying on fields 4 and 8 is in favour of no nitrogen, even though the nitrogen fields received

lime at the commencement of the season to correct the acidifying effect of the sulphate of ammonia. These results would indicate a deleterious effect from sulphate of ammonia. In the case of field 10, the difference is in favour of the nitrogen-treated area, but this field was not brought under the scheme until 1931, and is therefore the youngest pasture and thus did not receive a large aggregate dressing of nitrogen as did the older fields. Records will be taken again this season.

At a field-day held on the 16th May, 1934, the farmers present were provided with voting-papers and asked to indicate the best portion of each field. The preference of the majority coincided with that conveyed by the above grazing figures, even to the placing of 10A ahead of 10B.

Grasses and Clover Strain Trials.

The two hundred rye-grass plots in field 7 still present an interesting appearance at all periods of the year, although during the late spring and summer the absence of rye-grass in the false perennial plots is disguised by the prolific growth of volunteer white clover. To throw further light on the relations between persistency and palatability, and to compare the actual carrying-capacity and production of certified versus uncertified rye-grass, one-half of field 6 was laid down in uncertified and one-half in certified rye-grass. The field was sown on 4th October, 1933, with 2 bushels of oats as a nurse crop. Two bushels per acre of rye-grass were used in each case, but the uncertified line comprised a mixture of five commercial strains, which had tested "A3," two "B3," "B3-4," and "B4," under the ultra-violet-light test. In each case 2 lb. per acre of uncertified white clover was also sown. The oat crop was cut on the 20th February, 1934. Fifteen hundredweight carbonate of lime per acre was applied to each half in May, 1934. Up to the end of June the cow-days per acre were in favour of the uncertified field, and although this was expected, it is interesting to record that at the field day above mentioned preference was expressed in the farmers' voting-papers for the certified portion.

The cocksfoot, red and white clover strain in field 5 was ploughed under this autumn. This trial has, at any rate, raised the question as to whether the inclusion of cocksfoot in a seeds mixture with certified rye-grass for land of good average quality, top-dressed annually, is not a waste of money. It was only for a short time in February that the best strains of cocksfoot showed up to any extent in competition with the strain of rye-grass used in the base mixture.

Rate of Liming Trial.

In Block 13, in which a heavy application of sulphate of ammonia had caused the change of composition of the sward in 1932 from clover to rye-grass dominant, carbonate of lime was applied at 1 ton, 2 tons, and 4 tons per acre. To date no differential results have been noted.

Cruciferous Trials.

In fields 1 and 2, blocks of 1 acre of eight varieties of swedes were grown, being sown down during the last week of November, 1933, the

seed being ridged and fertilized with a mixture of 3 cwt. superphosphate and 3 cwt. carbonate of lime per acre. A dry spell delayed germination some weeks, but from January onwards growth was good. The varieties were weighed up on 14th May, 1934, with the following results :—

Variety.	Yield, in Tons.
New Colossal Tipperary	.. 44·25
Halewood	.. 40·15
World's Best	.. 40·15
Champion Purple Top	.. 40·05
Conqueror	.. 39·35
Superlative	.. 36·75
Monarch	.. 30·00
Magnificent	.. 24·40

Favoured by the slow-growing conditions in the early part of the season, club-root infection was prevalent, particularly in the varieties Monarch, Magnificent, and Superlative—the two former, however, being the only varieties showing serious bulb-infection.

In the same field a small trial of farm seeds was carried out also, sixteen lines being sown with the planet Junior on land pre-ridged and pre-fertilized with the mixture employed in the variety trial. In this case, two points were of interest—the great superiority in growth maintained by the variety Giant Broad Leaf Essex rape over the ordinary Broad Leaf Essex, and the favourable germination and growth of a New-Zealand-grown line of chou moellier in comparison with a commercial imported strain.

Club Root Trials.

In field 9, of the three hundred selected Bruce turnip bulbs transplanted, 132 bulbs were individually harvested. These lines will be sown separately this season in the Dunedin district and the best lines again seeded. It is hoped in this way to secure some choice lines of mother seed. A bulk selection of the Winton line was sown in January with other locally produced lines. A club-root count taken in May showed 9 per cent. of infection in the Winton line compared with 36 per cent. in the control line, consisting of Aberdeen Purple Top. An interesting feature observed was the confirmation of the fact that the Bruce variety does not breed true, as two green-top turnips were produced as the progeny of the selected bulbs.

In field 9 there was also a club-root trial, with twenty-four varieties and strains of swedes and turnips. Germination was delayed by a dry spell and club-root developed seriously. From counts taken on 15th May, 1934, the best varieties from the point of view of resistance to bulb-attack were the Mai turnip, one strain of Bruce ex Aberdeenshire, and a selection of a New-Zealand-raised swede. In passing, it may be mentioned that the Mai is a soft turnip and has proved to be a very low yielder when grown in Southland last year.

Wheat Variety Trial.

On 3rd October, 1933, a wheat variety trial was laid down in collaboration with Dr. O. H. Frankel, of the Wheat Research Institute, Christchurch. The technique employed was on the lines of the small-scale

yield trials at Lincoln, the seed for each plot being weighed out at Lincoln, and sown by hand in rows 12 in. apart. At harvest the heads from each plot were put in bags and railed to Lincoln, where they were threshed and weighed. The procedure proved simple, economical, and comparatively accurate, differences of about 5 per cent. in many cases being statistically significant. An added advantage of the small size of the area was that it made possible the netting of the plots to prevent bird damage, but only five of the ten replications laid down could be protected in this way, owing to shortage of netting. Had the remaining five replications been harvested, the accuracy of the trial doubtless would have been considerably increased. The yields recorded were :—

Variety.	Bushels per Acre.	Percentage of Yield below Solid-straw Tuscan.
S 617 (Portugal 19) ..	54·5	24·6
S 633 (Portugal 27) ..	54·8	24·1
S 662 (Portugal 42) ..	50·5	31·2
S 767 (Portugal 99) ..	54·7	25·3
Marquis	48·8	37·6
Jumbuck	47·2	39·7
Montana King	55·9	28·6

All the varieties show considerably lower yields than Solid-straw Tuscan (24–39 per cent.). It should be noted that the above yields are calculated on the fact that the rows are 12 in. apart, whereas probably the same weight of grain would be produced if the area had been sown in 7 in. drills, as is usual. Thus, the above figures could nearly be doubled. In view of the heavy yields obtained in this trial in comparison with others, further trials will not be conducted at the area, but on ground of lower fertility elsewhere in the district.

The promise of earliness was fulfilled, two to over three weeks' difference in the maturity being obtained between Tuscan and the earlier varieties. The fermentation times (after Pelshenke) of the Portuguese lines was superior to Tuscan, and those of the other varieties very markedly superior. The baking scores supplied by the Wheat Research Institute show that S 617, S 662, S 767, and Montana King were equal to Tuscan, Marquis was slightly superior, and S 633 and Jumbuck very markedly superior.

Miscellaneous.

A small trial which contained twenty-four varieties of wheat was also conducted, to afford material for examination for rust-resistance. Rust developed on eleven varieties only. In April, 1934, an oat-variety trial was laid down. A further series will be spring-sown. In part of field five blue lupins at the rate of two bushels per acre were sown in April, 1934. Grass had been established in this field late in the previous autumn, but the clover had suffered severely from frost-lift. Due to the clover deficiency the grasses had not been vigorous, and the lupin-seed was disked in after being broadcast.

By the end of May the lupins were well established and 5 in. in height, and a noticeable improvement has been wrought in the vigour of the grass sward.

The area was visited by the Prime Minister, the Right Hon. G. W. Forbes, and party, on the 24th January, 1934. He expressed his approval of the work being conducted. In addition to the Government subsidy, material assistance has been forthcoming from the trustees of the R. M. Mackinnon Estate, and appreciation of this aid is gratefully acknowledged by the committee. A change in the managership occurred in July, Mr. G. L. Smart tendering his resignation and being succeeded by Mr. P. McMillan. Through the courtesy of the chairman of the farm committee (Mr. D. H. McLean, of Caroline), a loan of a top-dresser for an indefinite period has been extended to the area and is much appreciated.

TRIAL OF WINTER FORAGE CROPS AT MASSEY AGRICULTURAL COLLEGE.*

A REVIEW OF THE PRODUCTION AND RELATIVE VALUE OF SOME OF THE COMMON PLANTS USED IN 1932 AND 1933 SEASONS.

W. A. JACQUES, Massey Agricultural College.

IN considering the problem of the satisfactory production of winter-grown crops for stock-feeding there are special features, apart from the actual husbandry, which may weigh heavily in their favour when balanced against the cost of producing such crops. The first of these is the problem of winter dairying. There are naturally many farms in New Zealand where winter milking has to be practised to provide a regular supply of raw milk for urban populations, but the problem of the extension of this to include manufacture of dairy-products may sooner or later have to be faced. The Imperial Economic Committee urges that all parts of the Empire pay a greater attention to winter milk-production in order to supply dairy-produce more evenly to the home market. Much has recently been written bearing on various aspects of the problem in New Zealand. It has been suggested authoritatively that it would be advantageous to this Dominion to depart from purely seasonal dairying and practise more uniform production throughout the year. It is stated that it would help to eliminate the excessive accumulation of stocks of New Zealand butter at certain periods and the absence thereof would steady market prices.

Among the most formidable factors which are limiting winter milking at present are the lack of cheap concentrated foods, and an inadequacy of grass growth in the permanent pastures. To overcome these disabilities the production of the required highly nutritious food on the farm must be undertaken. It is impracticable to shut up a large enough area of permanent pasture in early autumn to grow a

* Paper presented at 1934 conference of New Zealand Grassland Association.

reserve of food for the whole winter season. Hay, roots, and silage by themselves are not quite satisfactory for the purpose of maintaining the cows in full production. These foods used alone are too bulky and would make too great a drain on time during the summer in their production and harvesting. The problem then resolves itself into growing a crop on some portion of the farm which (*a*) will grow better than pasture during winter, (*b*) can be grazed during winter, (*c*) will yield well for the full period required a fodder at least equal to grass, and (*d*) repay for the cost of reseeding the area down to permanent pasture.

In order to obtain more information on the relative value of some of the crops widely used for winter grazing, not only by dairy cattle but by also sheep, a series of plots was laid down at Massey College for the winter periods of 1932 and 1933. It is not practicable to cost the crop based on experimental plots, so that this aspect has not been dealt with. The plants tried out include prairie-grass, College and Australian Algerian oats, Italian rye-grass, black skinless barley, Cape barley rye-corn, vetches, and red clover.

The plots were fenced off from the stock and the produce cut periodically with shears, dried, and weighed. Owing to the difficulty of taking herbage samples during winter free from external moisture, and due also to the varying amounts of moisture held by the different plants, it was found necessary to oven-dry the samples. By taking periodic test-samples when the herbage was externally dry it was possible to calculate back to green weight, and the figures given in this paper are for green weights only. In both years the forage crops followed run-out grass and were manured with 2 cwt. superphosphate per acre.

Growth Habit of the Different Plants.

In the first year the crop was sown on the 26th March and on the 6th March in the second year.

The first cutting was made fifty-nine days after sowing, but the prairie-grass and Italian rye-grass were not sufficiently advanced to cut. Where there was an admixture of a cereal and rye-grass, the cereal contributed by far the greater bulk. Where rye-corn and vetches were sown together the greater bulk was given by the latter.

In the first two months all the cereals outyielded Italian rye-grass and prairie-grass, and the red clover yielded nothing.

Recovery after cutting and grazing.

Black skinless barley was outstanding for recovery after the first cutting. Cape barley, though not quite so good in this respect, was better than oats, and rye-corn was also slow. Where these crops were grazed with dairy cattle the black skinless barley was very evenly cropped, and in consequence recovery was even, and the same can be said of the oats and rye-grass. Cape barley, however, was unevenly grazed, and appeared to be less palatable, and there was more waste from trampling. In the second season both barleys were grazed equally by the cattle. The relative lack of palatability of Cape barley was much more evident when the three cereals sown in strips with and without

Italian rye-grass were tried out on a different area under sheep-grazing. The sheep showed a very marked preference for the oats and grazed them bare, then grazed the black barley moderately and without obvious relish, but neglected entirely the Cape barley, which had to be fed off with bullocks.

Three months after sowing the oats were suffering from an attack of "red leaf," and where this was most evident recovery after cutting and subsequent growth were slow. By the 2nd August this infection was at its height, and it was not until early September that the plants were able to overcome it. Vetches made good early growth, but were not extensively grazed, and where grazing did occur their recovery rate was slower than that of the cereals. Prairie-grass was very slow throughout the whole of the period under review, and cannot be regarded as satisfactory when down for only one season.

By mid-August the rye-grass was making headway and was starting into more active growth. The barleys, on the other hand, were falling off in production and were much less leafy. This was particularly marked in the case of the black barley, and Cape barley all through has been the more leafy plant. Rye-corn, which was very slow in the early growth stages, only started to produce with the advent of warmer weather. In both seasons its winter production was so poor that no weights were taken. The red clover was not in evidence, and it has so far contributed nothing towards the grazing, and only came into prominence in the late spring.

By early September the rye-corn was beginning to get stemmy and was mainly neglected by the cattle and grazed less evenly than the other cereals. The barleys had passed their zenith of growth and were yielding very little. The oats that were free from "red leaf" yielded a good crop and were the most leafy of the cereals. The Italian rye-grass was approaching its best. When cut for silage on 22nd October the cereals were in head, but the rye-corn, which was the most advanced, presented a stemmy and fibrous crop with little leafage and nothing to recommend it for silage purposes. Black barley was less leafy and suffered more from rust than the Cape during the first season, but mildew attacked the Cape and not the black barley in the second year. Oats were the latest and the most leafy of the cereals even though they had been grazed more closely than the others.

The vetches, where grazed lightly, continued to thrive and kept up with the cereals in rate of growth, but where they had been cut or grazed more heavily they failed to recover and were disappointing for silage purposes. Italian rye-grass, whether sown alone or with a cereal, was growing strongly and was not far enough advanced in growth when cut to give its best yield of silage. It was only on the plots where rye-grass was sown that weeds were suppressed.

The Second Season's Trial.

In the main, the growth features of the plants were the same as in the first season. The incidence of disease, however, affected the oats to a lesser extent and the Cape barley slightly more than in the previous

season. The second season has thus been chosen for a more critical review of the seasonal production. The results of the winter of 1933 are as follows:—

Crop.	Cut 26th April, 51 Days after Sowing.	Cut 30th May, 85 Days after Sowing.	Cut 18th July, 134 Days after Sowing.	Cut 23rd August, 170 Days after Sowing.	Total Green Weight per Acre of Grazing.	Cut 8th November, 247 Days after Sowing.	Total Green Weight per Acre of Grazing and Silage.
	First Cut.	Second Cut.	Third Cut.	Fourth Cut.	Total.	Silage.	Total.
	T. c.	T. c.	T. c.	T. c.	T. c.	T. c.	T. c.
2½ bushels Algerian oats and ½ bushel winter vetches	2 13	1 2	1 19	1 15	7 9	10 13	18 2
2½ bushels black skinless barley and ½ bushel winter vetches	3 11	1 18	1 4	0 18	7 11	8 13	16 4
2½ bushels Cape barley and ½ bushel winter vetches	3 4	2 2	1 11	1 5	8 2	9 19	18 1
4 bushels Algerian oats* ..	2 13	1 8	2 9	1 15	8 5	8 0	16 5
4 bushels College Algerian oats*	Nil	4 3	1 18	1 9	7 10	10 18	18 8
4 bushels black skinless barley	5 2	1 17	1 4	1 4	9 7	5 8	14 15
4 bushels Cape barley ..	3 10	1 14	1 10	1 4	7 18	6 1	13 19
3 bushels Algerian oats and 20 lb. Italian rye-grass	2 3	1 11	2 10	1 9	7 13	11 15	19 8
3 bushels black skinless barley and 20 lb. Italian rye-grass	4 7	1 12	1 13	0 17	8 9	9 14	18 3
3 bushels Cape barley and 20 lb. Italian rye-grass	3 11	1 11	2 4	1 4	8 10	9 17	18 7
3 bushels rye-corn and 20 lb. Italian rye-grass†	Nil	2 0	2 13	1 17	6 10	11 13	18 3
40 lb. Italian rye-grass ..	Nil	2 6	2 16	1 11	6 13	10 6	16 19
35 lb. Italian rye-grass and 5 lb. red clover	Nil	1 17	2 10	1 13	6 0	10 17	16 17
40 lb. prairie-grass	Nil	0 12	1 16	1 14	4 2	11 0	15 2

* Algerian oats are of Australian origin unless otherwise noted. † The rye-corn, both when sown pure and in combination with vetches, was so poor that weights were not taken. Rye-corn in combination with rye-grass was weighed, but by far the greater bulk represented the rye-grass.

Growth Period.

It will be seen from Table 1 that some of the combinations or pure seedings gave heavy yields under a system of cutting comparable to grazing and also gave a satisfactory hay or silage crop. Others again gave either a heavy yield for grazing and little hay or silage or else heavy silage crops with relatively little grazing. The growth-habits can be further analysed according to the period within the winter grazing season at which most growth is recorded. For the purpose of this record five cuttings were made on each of the plots, with the exception of the College Algerians, prairie-grass, Italian rye-grass alone and with red clover and rye-corn. There was insufficient growth to warrant them being cut and weighed on the first cutting date, and, in consequence, the produce of the first two growth periods is recorded in the second.

In addition, the whole field was subsequently cut for hay, but none of the cereals and only the rye-grass, red clover, and prairie grass contributed to it. Weights were not taken, but it is estimated that the

yield of hay was in the vicinity of 1 ton per acre, the prairie-grass giving a somewhat heavier yield than the rye-grass alone and about equivalent to the yield on the rye-grass and red-clover plots.

Seasonal Productivity.

It will be seen from the table that the different grasses and cereals varied considerably in their productivity at the different seasons. The figures represent the weights of green material from the respective plots at the five cuttings. The following points present themselves from an analysis of the yield table.

A CEREAL WITH VETCHES.

Algerian Oats and Vetches gave a moderate initial yield and a slow recovery, after which the yield increased as the winter gave place to spring. The silage crop was not so heavy as where Italian rye-grass replaced the vetches, and was only slightly below that from rye-grass and red clover and from prairie-grass. The amount of winter grazing was better than Italian rye-grass, but below that of the barleys, though the total yield (including the silage crop) was greater in both cases.

Black Skinless Barley and Vetches gave a large initial yield, but production then fell away rapidly, and only a moderate yield of silage was got.

Cape Barley and Vetches gave a smaller initial yield than the black barley and vetches and the subsequent recovery was better, but, unlike the oats, production decreased as the season advanced. Even so, a greater amount of grazing was got from this plot than from the two previous ones, and though the silage crop was smaller than in the case of the oats and vetches the total yield from both mixtures was approximately the same.

A CEREAL WITH ITALIAN RYE-GRASS.

The total yield from mixtures of a cereal with Italian rye-grass was greater than in the corresponding mixtures where vetches were used, but a heavier seeding of the cereal was given.

Algerian Oats and Italian Rye-grass gave a moderate initial yield, consisting mainly of oats, but recovery after the first cut was better than in the case of oats and vetches, and production gradually increased as the season progressed. The final silage crop was the heaviest of any produced, and amounted to 11¾ tons green weight, though the grazing was less than in the case of the barleys with rye-grass. The influence of the rye-grass was becoming apparent in the third cut (mid-July) and assisted substantially in giving the extremely satisfactory yield of silage. As these two plants are slower in maturing than the barleys and rye-corn the cutting date for silage could have been postponed to their advantage.

Black Skinless Barley and Italian Rye-grass gave a very heavy initial growth, but production decreased considerably after the first cut. The Italian rye-grass was at a disadvantage on account of this excessive early competition, and did not properly recover until spring, when it featured very largely in the silage cut. The total yield and

the weight of silage from this combination was higher than from either black barley alone or with vetches. It gave less grazing than the pure sowings, but was better than the barley and vetches.

Cape Barley and Italian Rye-grass also showed to some extent the suppressing effect of rapid early growth of the cereal on the rye-grass. Only in the third cut did the rye-grass add materially to the yield. The yield of grazing and silage differed little from the corresponding black-barley plot, but the grazing was better than for oats and rye-grass, and the silage cut and total yield were less.

Rye-corn and Italian Rye-grass form a poor winter grazing combination. The weight of the silage cut was almost equal to that of oats and rye-grass, but there could be no comparison between them for stock-feeding purposes, the rye-corn being very stemmy and fibrous, while the oats were leafy and more succulent. Thus the oats and rye-grass gave more grazing, as much or more silage, and a better feeding-product. These factors in themselves rule out rye-corn for winter-production purposes.

PURE CEREAL SOWINGS.

Algerian Oats.—The Australian seed was earlier in growth than the College variety and produced more grazing through the winter. The latter, however, more than compensated for this by the very heavy silage crop yielded and finished by producing over 2 tons more (green weight) than the Australian seed. The College variety is the latest maturing of the cereals tried and it was not enough advanced in growth for a first cut to be taken on 26th April.

Black Skinless Barley gave the heaviest first cut of all the plants on trial, but, after this, production lagged considerably. Even so, the amount of grazing was heavier than from any other series. The silage cut was very disappointing, and was only half that given by the College Algerians. This brought down the total yield to a very low figure, and, excluding Cape barley, was the lowest in the trials.

Cape Barley alone gave a poorer yield of grazing and rather a heavier silage crop than the black barley, and the total yield was the lowest in the trials. As has been mentioned previously, mildew attacked this crop to a minor degree, and the true reflection of this on yield is impossible to determine, but it is feasible to suppose that the total yield would have been at least as great as that of black barley. The yield at the first cut was intermediate between that of oats and black barley, and recovery and subsequent yield were no better than for black barley.

GRASS AND CLOVER SOWINGS.

Italian Rye-grass with and without Red Clover gave a very poor initial yield as compared with the cereals. Even on the second cut, eighty-five days after sowing, the yield was relatively poor, but the third cut (mid-July) was the heaviest got from any of the trial plots, while the fourth cut (23rd August) was only slightly exceeded by oats and oats and vetches. The red clover, though it germinated and showed above ground sixteen days after sowing, did not contribute substantially to the yield until the final (silage) cut, where red clover and rye-grass outyielded the pure rye-grass sowing. Owing to the relative slowness of growth, the silage crop would have been heavier had these plots

been cut somewhat later. The amount of grazing was disappointing, and was less than from any of the pure cereals, but the heavy silage crops placed them above the pure barleys for total yield.

Prairie-grass as a grazing crop in the first season was very unsatisfactory, and gave the lowest yield of grazing of any of the plots. It was comparatively slow in establishment and yielded poorly until the final cut (silage), when it was exceeded by oats and Italian rye-grass. This brought the total yield higher than the pure barleys, but not up to the level of any of the other plots.

Discussion.

It will be seen from what has already been written that by a study of stock-feed requirements it is possible to regulate the supply of winter-grazing crops accordingly. Where a grazing is desired from April to the end of May the barleys are outstanding, but their subsequent growth is so poor that to sow them alone does not seem desirable. If they are sown with 1 bushel of rye-grass a good silage crop can be assured, and, if required, a subsequent crop of hay can be got from the rye-grass. The weakness of this combination lies in the period between the end of May and the end of August, when production is low. The rye-grass is suppressed strongly by the heavy initial yield of the cereal and only recovers as the barleys fail. This suppression of the rye-grass is less evident with Cape barley than with black skinless, but it is relatively less palatable. No other plant tried can approach the barleys for early growth. For production later in the season both oats and rye-grass are outstanding, and a combination of the two gives the prospect of a very heavy silage crop and a further hay crop if so desired. This combination of a cereal with rye-grass from a yield point of view, and where grazing is an important feature, is better than oats and vetches or oats alone, and better than rye-grass alone or with red clover. Prairie-grass is out of the question for a single season's production, as, although the yield in spring is good, it is too slow in establishment for a winter-grazing crop. Rye-corn did very indifferently in the trials in both years, and cannot be recommended for this purpose.

The disadvantages of the pure sowings briefly are: (1) Danger from disease in the cereals, which lowers their production and palatability; (2) the extreme tuftiness and lack of foliage in the black barley after the first two grazings, which makes it unsuited for ensiling; (3) the lower palatability of Cape barley; (4) the relatively poor early growth of oats; (5) silage made from cereals is not suitable for keeping longer than one season when stacked owing to the rapidity of deterioration; (6) Italian rye-grass, like oats, is too slow in its development to warrant being sown alone; (7) it is poor economy to grow for winter feed a crop which requires to be reploughed and reseeded in spring before the silage crop is taken (as with barley) or if the silage is taken (oats) where there is risk of the failure of the succeeding crop due to lack of soil-moisture.

The sequel to an even production throughout the winter would be to divide the area for winter forage crops into two. In one-half sow black barley with rye-grass and in the other oats and rye-grass. The areas need not be fenced separately, for, although the oats will attract

the stock first and they will be grazed closer to the ground than the barley, yet the growth habit is such that little damage is done to them. The gradual increase in the amount of rye-grass appearing in the barley will continue to attract the stock to that area and the barley will be grazed with it. The oats are at all times palatable and eagerly grazed, but the barley will not be neglected.

The effect of the incidence of disease in either the oats or barley will be less felt where rye-grass is present. If disease appears on the cereal, the decreased competition from the infected plants enables the rye-grass to increase its production earlier as a compensation. In view of this danger of disease appearing in the cereal, rye-grass should always have a place in such a winter programme. Also the very early spring feed it provides is extremely important in dairying. It is more palatable to stock than permanent pasture, and it helps to avoid excessive defoliation of the best fields at a time when the cows are in full milk and when the pastures are very sensitive to hard or close grazing. Similarly, it reduces the necessity of cutting the permanent grass paddocks too frequently for hay or silage, and thus helps towards a greater production over the whole farm and a better return from the stock. I suggest that the combination of these factors alone warrants and covers the cost of ploughing up and reseeding to permanent pasture. It is impossible to assess the cash value of such a crop as its benefits are not confined solely to its immediate returns, but are distributed over the farm.

The heavy seeding of cereals as described here may appear excessive on some farms though not on others. In seasons when cereals are cheap heavy seedings are likely to be more profitable than lighter sowings, but where rye-grass is sown conjointly with a cereal, heavy seedings should be avoided, as any increase in yield from the cereal is discounted by a slower recovery of the rye-grass. Thus the earlier the cereal in producing its maximum yield, the greater the danger to the rye-grass through too heavy seeding.

It is desirable, in order both to conserve the amount of feed in winter and to prevent digestive trouble in the cattle, to limit the grazing period to one not exceeding two hours per day.

With the improvement of Italian rye-grass now being undertaken it would appear that the benefit to be derived from the inclusion of this grass in the cereal sowing will be considerably greater in the future.

It is highly probable that sowings at dates substantially different from those followed in the trials under discussion would modify the results materially.

Control of Cattle-tick.—During recent years the whole aspect of the cattle-tick question in New Zealand has more or less undergone a change, a realization that the tick is not a dangerous stock parasite having taken the place of the dread at first created by the discovery. In the control of cattle-tick much can be accomplished by individual effort. Farmers in tick-infested areas could largely prevent tick propagation by the burning or destruction of all cover which gives the immature ticks protection during the winter months. This, combined with other protective measures, would materially tend to keep their numbers on any one farm very low. With respect to this point the District Superintendent, Auckland, makes the following remarks: "I am quite sure that ticks can be controlled to a great extent if property-owners will spray their cattle a few times during the worst season of the year, hand pick at other times, and also clean up and, if possible, burn rubbish in odd parts of the farm."—*Report, Director, Live-stock Division.*

ELECTRIC TRACTORS.

FIELD EXPERIENCE IN CANTERBURY.

E. M. BATES, Instructor in Agriculture, Ashburton.

THE prospects of a closer coupling-up of New Zealand's great electrical resources to our agricultural industry, by the greater use of power, appear very bright now that the possibilities of the electric tractors have been clearly demonstrated on a number of Mid-Canterbury farms by the cultivation work carried out by locally made electric tractors. It is clear not only that these tractors are dependable, but that they are characterized by cheapness and ease of operation.

FIG. I. CLOSE-UP VIEW OF ELECTRIC TRACTOR, SHOWING THE CRANE TAKING UP THE CABLE.

The winding-gear is quite automatic.

Though the cost of power is a very heavy item on most of the arable lands of Canterbury, yet probably it has received the least attention from research workers. Power on the farm to-day is supplied principally by horses, but internal-combustion tractors also play an important part, there being about 1,800 in Canterbury.

From the national aspect the utilization of electric power for cultivation work is most desirable. The absorption of our surplus electrical power by the agriculturist, the manufacture of electric tractors, and the reticulation of farms would result in further employment without any displacement of labour due to any change-over, and, further, a more general use of electrical power would probably result in a general lowering of power charges.

That we are now in a position to utilize the power generated from our abundant water-supplies in the tilling of our fields with a reduced financial drain on the country is an inspiring thought.

General Description of Electric Tractor.

The first electric tractor was built on a 12/24 horse-power Hart-Parr chassis with a 20 horse-power three-phase motor in place of the kerosene power-unit, with 20 chains of flexible C.T.S. cable on a drum with automatic winding-control gear. An ammeter to indicate loading and a watt-hour meter are in the supply-line. The cable is automatically laid and rewound as the tractor moves to and fro in any desired direction from the plug-in point, and it is impossible to run over the cable, which causes no trouble or inconvenience to the operator. This tractor has now been in operation for two years and its operation is

FIG. 2. THE ELECTRIC TRACTOR CULTIVATING AND ROLLING IN ONE OPERATION.
The cable is being laid behind the implements and easily clears these.

delightfully simple and easy, besides being quite fool-proof and free from complications of any kind, and the use of a transformer-truck, which is part of the outfit, makes the tractor quite mobile.

The difficulty of moving the end of the power cable from one plug-in point to another has been overcome by the use of the transformer-truck. This consists of an old truck or converted car fitted with two gear-boxes giving a wide range of gearing and carrying a transformer with a convenient connection to the power-lines. Contact with the power at a different place can be made in a few minutes with the truck in a very simple, safe, and ingenious method by driving the truck to the required pole, pulling a lever, and making a ground connection. The truck can also be used for bringing up implements and for long cartages of the tractor if required.

The electric tractor has the following advantages: (1) Economy of operation—about half that of the kerosene tractor and comparable and competitive with the crude-oil tractors; (2) quickness and ease of starting, with smooth and quiet running on the drawbar or belt;

(3) freedom from fumes and noise; (4) plenty of overload capacity when necessary; (5) no danger of excessive power-unit wear in operating at full load; (6) accurate costs of working available at all times; (7) immediate means of judging efficiency of setting ploughs, &c.; (8) low operating-costs at low capital outlay; (9) no cartage of fuel, no refuelling, changing of lubricating-oil, or draining and filling with water.

A disadvantage of the tractor is its unsuitability to work round a field—a matter of small moment, except in case of, say, reaping a standing crop. Methods whereby the tractor and also the transformer-truck could be used are under consideration and will be tried out on

FIG. 3. SIMILAR TO FIG. 2, EXCEPT THAT CABLE IS BEING WOUND IN.

standing crops this season. On a number of farms headers are now being used, but the autoheader is the only one not requiring to be drawn by horses or tractor.

General Costs of Farm Power.

There has been a tendency since the beginning of the depression to revert to horses for farm-power. There are now indications that the tractor is again coming into favour. The principal reason for the favouring of horses was said to be cheapness of operating, but investigations show that the underlying reason was the reduction of the cash outgoings from the farm possible with horses as against tractors—the gross cost was not seriously considered. Putting the cost of a six-horse team at £300 per annum and the working-time 250 days of eight hours, the cost per hour is 3s. A medium-sized tractor has about 50 per cent. more, and a large tractor 100 per cent. more output than a team and can also be worked long hours at rush periods. The total operating-costs of a kerosene tractor is about 5s. to 6s. per hour, and is therefore competitive with horses. The increasing capital cost of horses is also a factor in encouraging a swing back to tractors. The

fact that the electric tractor does not entail a high capital outlay, is cheap to run, has a long life, and can be worked for longer hours than a kerosene tractor, when consideration is given to the loss of time refuelling, changing of engine-oil, and starting, are all points in its favour as far as costs are concerned.

Some Results of Operating-costs with Electric Tractors.

An electric tractor provides a direct method of ascertaining relative costs for the various cultivation operations, for testing the relative efficiency of implements with greater accuracy than any other means by the direct measurement of current used. Horses and kerosene

FIG. 4. THE ELECTRIC TRACTOR PULLING ROTARY HOE.
Cable is being wound in automatically. Note the power drive to the hoe.

tractors can only be approximate, and the latter usually are underloaded in fear of consequences of overloading.

The following is a brief summary of some of the work carried out to date, using mainly the first experimental tractor with a 20-horse-power motor.

(1) *Ploughs.*

The draught of the first plough used—a four-furrow American plough—was reduced by measurement of current used in different setting by 6 horse-power. Ploughing has only been carried out on heavy land to date. Ploughing out of stubble 7 in. deep in June with a four-furrow American plough in middle gear at three miles and a quarter per hour used 19 units per acre, which at 1d. per unit cost 1s. 7d. an acre. In low gear at two miles and a half per hour took 18 units per acre, or 1s. 6d. an acre for power. A New Zealand plough in low gear took 24 units per acre.

At Springfield in skim ploughing 2½ in. deep on heavy clay soil out of four-year-old grass, mainly twitch, and used as a horse paddock,

a New Zealand plough showed 25 per cent. increase in power requirements over an American plough and made a poorer job on the hardest portions on account of riding out of the ground. The short mouldboard of the American plough did not give the hard packing of the New Zealand plough, more especially with the deep ploughing, and while it did not make such a pretty job, the more broken furrow appears preferable quite apart from the lighter draught. Results as the above raise a doubt as to the suitability of the design of New Zealand ploughs, and, while not necessarily conclusive, indicate the advisability, in the interests of cheaper cultivation costs, of a study of the whole question.

(2) *Top-working Implements.*

An eleven-tine spring grubber on skim-ploughed twitchy paddock in middle gear used $7\frac{1}{2}$ units per acre. After harrowing with tripods it used 7 units per acre. A second grubbing in top gear used $6\frac{1}{4}$ units per acre. Contrary to farmers' opinion, the grubber was not a full load for the tractor. A third grubbing with also a set of twitch harrows behind used 9 units per acre. Tine harrows with a set of tripods in front used $10\frac{3}{4}$ units against 7 units with tripods alone. With the accumulation of data of this sort, implements could be made of sufficient width for most economic loading, or the work conducted by using implements in pairs. The ammeter indicates directly what the loading actually is.

Tests such as the above are ones that any farmer could easily make for himself, and there is no doubt that work with a high degree of precision and of very great value to the farming community could be compiled. Tests on the electric tractor indicate that at full load approximately 40 per cent. of input is taken up by the tractor, hence for economic operation "the paying load" must be kept up.

Tobacco-culture.—There has been a reduction in the area planted in tobacco for commercial purposes during the year ended March, 1934. This was largely due to the fact that the manufacturing companies operating in the Motueka district, where the bulk of the crop is grown, intimated to growers at the beginning of the season that only the amount of leaf contracted for would be purchased, thereby placing a limit on the area planted. The total area under tobacco in the Dominion was approximately 2,500 acres, the bulk of which—some 2,000 acres—being cultivated in the Motueka district. In the other tobacco-producing districts the acreage was: Auckland, 334 acres; Nelson, 60 acres; and Marlborough, 16 acres. A considerable quantity of tobacco was also grown in garden plots for private use.—*Report of Director, Horticulture Division.*

Mycotic Dermatitis.—This inflammatory condition of the sheep's skin has been found affecting flocks in different districts. Several cases of its occurrence have been noted in Canterbury. It is an inflammatory condition of the skin, with resulting scabs, which grow up in the wool, forming dense, hard masses, which render shearing difficult or impossible. The disease is caused by a mould or fungus and is contagious. The disease is common in Australia, where it is said to occasion considerable economic loss. Moist conditions favour its development, and it is more common in districts with heavy rainfall. There is no known treatment for the trouble, and separation of affected from healthy sheep is essential to prevent spread. Sheep-farmers would be well-advised to report any suspicious cases to the Department for investigation.—*Report of Director, Live-stock Division.*

SOME OBSERVATIONS ON THE IMPORTANCE OF SUBTERRANEAN CLOVER AS A PASTURE SPECIES.

W. J. McCULLOCH, Fields Superintendent, Palmerston North.

WITHIN recent years much attention has been focused on the more important pasture species, the majority of which are particularly adapted for high production on the better-class soils with a reasonably heavy uniform rainfall. Unfortunately there are large areas, usually lighter and drier, in this Dominion not fitted to carry these high-class pasture species profitably, and some observations relative to the value of subterranean clover on these lighter and drier soils may prove of interest.

One has in mind, particularly, areas of light country in the eastern districts of both Islands where pasture growth practically ceases in the late summer months owing to lack of moisture and where the soil fertility cannot be raised economically to the standard demanded by high-class pasture species.

Subterranean clover has for many years been recognized in New Zealand (sometimes as Mangere clover, especially in Auckland) as a somewhat useful species on the light, poor country which normally dries out badly in the summer months and on which conditions would be too severe for white clover or the better grasses. Subterranean clover is a free seeder capable of re-establishment annually, and under such conditions its introduction on these soil types has been looked upon as a useful development in that the feed it provides is a much preferable alternative to practically no feed at all, such as often obtains at present. While in the main such a viewpoint cannot be condemned, it falls far short of present-day knowledge of the importance of subterranean clover on the poorer dry soils under good management. It may be stated definitely from results obtained that subterranean clover can be very profitably exploited on these particular areas, as is indicated by the experience of Mr. J. Caldwell, Spring Hill, Ruatanawha Plains, Hawke's Bay.

An area of 600 acres of very light country was taken over by Mr. Caldwell in 1914. The normal annual rainfall is very low and the light-textured soil is incapable of retaining moisture satisfactorily, and in consequence ordinary grasses and clovers cannot withstand the hard conditions. In its natural state it supported manuka scrub, and in the words of Mr. Caldwell " grew Strathmore weed to perfection."

To give some indication of the class of soil Mr. Caldwell recalls that the first paddock broken up in 1914 (fig. 1) was badly blown, after which only the two top wires of the seven-wired fence on one side of the field was visible. This paddock was eventually sown down in 1918 with a mixture of rye-grass, cocksfoot, Chewings fescue, and white clover, but rapidly reverted to manuka and Strathmore weed. In 1928 it was cleared of scrub, cultivated, and subsequently sown out in a stand of pure subterranean clover at 10 lb. per acre with the result indicated by fig. 1.

FIG. 1.

This paddock carried, from 1st August to 28th November, when photograph was taken, 8 cows and 3 horses, in addition to 140 ewes with 100 per cent. lambs, which were carried from 1st August to 2nd November, when lambs were drafted fat, as part of a line of 475 lambs which averaged 36·85 lb. Area of paddock, 35 acres.

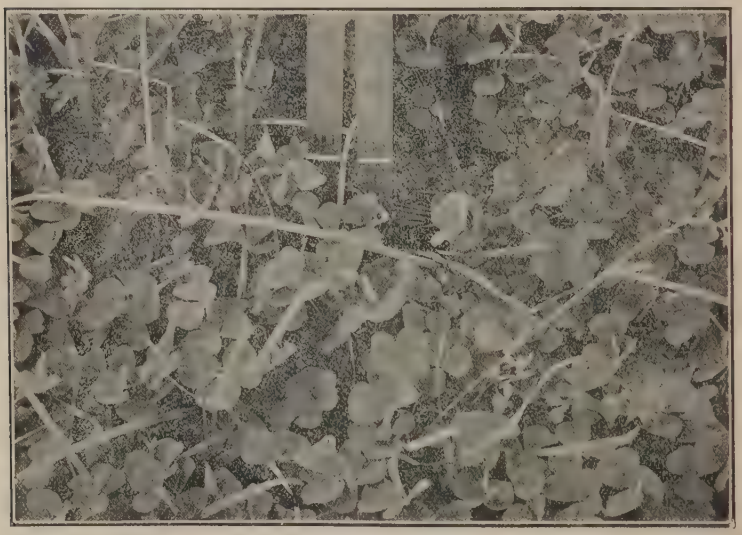

FIG. 2. CLOSE-UP VIEW OF PADDOCK SHOWN IN FIG. 1.

From 1914 until eight years ago the total stocking of the 600 acres never exceeded 400 breeding-ewes, and no fat lambs off their mothers were produced. A team of horses was kept busy in an attempt to grow rape for lamb-fattening, which more often failed owing to dry conditions, in which case the lambs had to be sold as stores. The production of winter feed for ewes also caused much anxiety for the same reason. The lambing was usually about 50 per cent., and one instance is mentioned by Mr. Caldwell when a total of only forty lambs were raised for the season.

No doubt only sheer tenacity, together with high market values for sheep products, made it possible for the owner to carry on during those difficult years. For the past seven to eight years, solely with the aid of subterranean clover properly managed, the stocking has steadily increased until the 600 acres now carries 1,200 breeding-ewes, which produced 110 per cent. lambs last year and 100 per cent. during the present season, and all go off the ewes fat.

During the past few years, since the advantages of subterranean clover have been fully realized, no crop is now grown either for fattening lambs or ewes or for wintering stock.

This season, out of a total of 1,200 lambs, 475 fat lambs were drafted on the 2nd November and killed at an average of 36·85 lb. per lamb. As a rule the ewes are fat at weaning and quickly follow each draft of lambs to the works.

It is hoped to dispose of all lambs and ewes as fat towards the end of December.

This type of management suits the habit of subterranean clover admirably, as by the end of December it completes its growth and matures seed ready for the first autumn rains.

A pure subterranean-clover pasture has certain distinct weaknesses, prominent among which is its failure to produce growth from about the latter end of December until, usually some time in March, the seed germinates with autumn rains. It is probable that this weakness could be overcome by the establishment of paspalum or cocksfoot, according to climate, in conjunction with subterranean clover, or the saving of sufficient of the surplus growth in spring as silage, especially as the period mentioned is merely a store stock one and only a matter of maintaining ewes intended to be held over for breeding purposes. If it is lightly stocked to allow the young seedlings to become firmly established they rapidly increase in vigour and eventually provide an abundance of late autumn, winter, and spring feed until the middle or end of December, when the clover begins to die off, having meantime produced seed heads the majority of which have buried themselves in the soil where they mature. Although fairly proof against grazing abuse, this plant responds admirably to reasonable care in the young-seedling stage and again when the seed heads are forming, during both of which periods it should not be grazed closely but rather a form of loose management involving the development of growth longer than is generally accepted as most suitable for sheep should be adopted.

Probably the most important factor of all in the establishment and maintenance of a luxuriant and profitable subterranean-clover pasture is the systematic top-dressing of the sward. No other plant responds more profitably to phosphatic manuring than subterranean clover, and

FIG. 3.

Paddock of 30 acres which carried 90 ewes, with their lambs, from the last week in July till 1st September, when 50 more ewes, with their lambs, were added. Both these lots of sheep were carried from 1st September to 26th November, except that 70 lambs were drafted fat on 2nd November.

FIG. 4. CLOSE-UP VIEW OF PADDOCK SHOWN IN FIG. 3.

in every instance the greatest success has been obtained from an application of from 2½ cwt. to 3 cwt. of superphosphate with the initial seeding, and subsequent similar applications annually about March. The seed should be sown as early in March as possible provided sufficient rain has fallen, the chief object being to encourage the young plants to obtain a good root-hold before heavy frosts occur. Late sowing should always be avoided.

Liming is unnecessary, as subterranean clover is well known to be more tolerant of soil acidity than any others of the clover family.

It is suggested that subterranean clover should be sown as part of a mixture rather than as a pure stand provided local conditions permit of some growth from other species. However, if conditions are too severe, then a pure stand of subterranean clover may be preferred, firstly because of its very profitable production, and secondly because of its great value as a soil-improver and a forerunner to rye-grass, cocksfoot, white clover, &c., in later years. A noticeable feature on Mr. Caldwell's pastures this season is the development of volunteer rye-grass, cocksfoot, and white clover, which indicates a general soil improvement. It is evident that the dying-down of considerable quantities of surplus subterranean clover growth each season is already responsible for an appreciable amount of added humus, which in turn has increased the moisture-holding capacity of these thin soils as well as their fertility.

The proportion of subterranean clover in a mixture may be varied in accordance with the rapidity with which dominance of this species is desired, and from 2½ lb. per acre, together with rye-grass, cocksfoot, white clover, &c., up to 8 lb. or 10 lb. where a pure stand is required, may be sown.

It is probable that where conditions are too dry or fertility is not sufficient a combination of cocksfoot and subterranean clover would best meet requirements, or, if too hot and dry for the former, it might be replaced by paspalum.

The above experience illustrates the value of subterranean clover on poor, light, dry soils, but there is evidence that subterranean clover is capable of raising the production of many thousands of acres of the poorer soils, and even on our better soil types its prolific growth in the winter and early spring months when other pasture species are practically at a standstill may justify its inclusion in such mixtures.

Mr. R. H. Matthews, owner of the well-known Wairongomai Romney stud flock, is emphatic from his experience that subterranean clover will not "take possession" on good soils to the detriment of other good pasture species, and he, in common with others, finds that on areas where subterranean clover is established it provides excellent feed with swede crops in which it appears during autumn.

Young stud rams commence feeding off swedes about the 20th April, and are not given a run-off as they thrive particularly well on a ration of swedes and subterranean clover.

Mr. Matthews is positive that since 1924, when subterranean clover was first sown, the ram hoggets have shown marked improvement.

On certain shingly paddocks of this property subterranean clover forms a dense sole and produces handsomely. That it is a very adaptable plant will be recognized, as the rainfall at Wairongomai is in the vicinity of 50 in. per annum.

Well-established subterranean clover produces heavy yields of seed, which apparently remains viable in the soil over a fairly lengthy period should the land be put under crop. This is evidenced in the case of Mr. W. H. Sadler, Tauherenikau, who is dairying on 130 acres, most of which is light, dry, and stony. Subterranean clover was introduced here over twenty years ago, and has since established itself over the whole farm. It does not appear to any extent in spring-sown crops which are fed off early, but always asserts itself in autumn-sown pastures in sufficient quantity without being added to the mixture, and here also it is highly valued for its prolific winter and early spring growth and for the definite soil improvement which has taken place, making it now possible to maintain an appreciable definite proportion of rye-grass, cocksfoot, and white clover on land which originally carried only danthonia and sweet vernal. Here also phosphatic top-dressing is applied annually.

FIG. 5. EWES, WITH LAMBS, CARRIED IN PADDOCK SHOWN IN FIG. 3 AS AT 28TH NOVEMBER.

Up to the present the seed is imported from Australia—none being grown in New Zealand. There appears to be no valid reason why this should be so; on the contrary there appears to be two very good reasons why New Zealand should produce its own seed requirements, namely: (1) The New Zealand farmer should be able to produce the most suitable strain profitably; and (2) the grave danger of introducing lucerne flea (*Smynthurus viridis*) with imported subterranean clover seed, which would be fatal not only to subterranean clover, but also to our own lucerne areas.

In conclusion, it is suggested that subterranean clover can play a very important part in increasing the production of the lighter, dry soils of this Dominion, and, as such, well merits further investigation in regard to strain and closer attention to management, &c.

PROTECTION OF PEAR-GRAFTS FROM THE PEAR-LEAF-CURLING MIDGE.

N. J. ADAMSON, Orchard Instructor, Hastings.

ALTHOUGH in some pear-growing districts the pear-leaf-curling midge (*Perrisia pyri* Bche.) is not a serious pest on mature trees, it is of considerable economic importance on young trees, and more particularly on new grafts. Recently there has been a good deal of activity amongst

pear-growers in reworking unprofitable varieties to the better-known and exportable sorts, and in many instances results have been very disappointing, due to the ravages of the midge. It is of vital importance in reworking fruit-trees that scions receive no injury which may weaken or destroy them. The midge is capable of actually destroying the scion, so that it becomes a matter of importance to afford some protection in districts where the pest is prevalent. Attempts have been made at times to protect new growth from scions by a light covering of muslin. The type of protection used by Mr. A. B. Clayton, of Havelock North, Hawke's Bay, as is here illustrated, afforded a complete protection to scions against the midge and allowed them to grow normally. The frames are constructed by fixing No. 14-gauge wire rings to light battens, which are nailed to the tree-stumps. Bags made from cheese-cloths are then drawn over the wire frame and tied at the bottom. A simple method of fixing the wire rings is by pressing the tie-in-the-wire into the soft-wood battens, using a vice for the purpose. The tie should be made in such a way as to leave ½ in. wire ends directed inwards, thus acting as a staple. Coverings may be left on until about mid-November, by which time the scions will have become well established and the midge attack subsided.

The photograph shows, on the left, the simple frame construction around a previously protected scion, which has grown without injury from midge ; on the right, a covered scion ; and in the centre one that has remained unprotected and that shows distinctly the injury which results from midge attack, and thus demonstrates the advantage of covering.

LIVE-STOCK POISONING IN NEW ZEALAND.

PROCEDURE IN COLLECTING SAMPLES FOR ANALYSIS.

B. C. Aston, Chief Chemist, Department of Agriculture.

(Continued.)*

In investigating any unusual mortality in domestic animals on the farm it may be necessary to obtain specimens for the analyst in order that he may examine them for the presence of poisonous plants or minerals. The farmer or other person who may be called upon to supply specimens from the dead animals is therefore required to obtain sufficient material for analysis, and if this work of sampling is not properly carried out the whole subsequent costly work of the analyst may be rendered useless. It is desirable to point out the correct method of obtaining samples in order that those responsible for this work may in future avoid the errors which have occurred in the past.

In order that the analyst may be able to say with certainty whether poison is present in the dead body in sufficient quantity to have caused death he must be supplied with sufficient material to enable him to extract the poison, identify and weigh it, and thereafter to calculate whether sufficient poison is present in the whole body to have destroyed life. The main fault to be found in the past has been that too little material has been forwarded to enable any decision to be reached by means of chemical analysis as to the cause of death. The larger the animal the more material must be taken, and where leaves of poisonous shrubs are to be sought it is in the highest degree necessary that a plentiful supply of the paunch contents be sent. If, as recently happened,

* First portion in this *Journal*, September, 1934.

no material from the paunch is sent and it is desired to identify tutu leaves in the mixture of food eaten it is hopeless to try to do this from the semi-digested mass in the fourth stomach and intestines.

The commonest kind of poisoning is undoubtedly that caused by substances classified as inorganic or mineral poisons, and it is in this case highly necessary to take samples of the liver and spleen as well as a copious supply of ingesta for the analyst as well as possibly other specimens for the use of the pathologist. Those for chemical analysis should be placed in clean containers, which are best obtained in advance as there is often difficulty in obtaining suitable containers on the farm at the last moment. The samples for chemical analysis should be sent as soon as possible to the Department's Laboratory in the Dominion Laboratory Building, Wellington, since it is not permissible to add any preservative or alcohol to the specimens to prevent putrefaction, and any delay in delivery is likely to hamper the work of the analyst owing to decomposition of the material, and even to militate against a successful result.

The appended directions should therefore be implicitly followed in collecting specimens for chemical analysis where poisoning is suspected.

(1) No metal, soil, or other contaminating substance should be allowed to come into contact with the animal specimens. Wide-mouthed, chemically clean glass or earthenware jars, fitted with earthenware covers or new cork bungs (not metal caps) should be used. Stomach and intestine contents should be allowed to remain in the natural organ, the apertures of which should be tied with string to prevent leakage.

(2) If possible, where concentrated food is used a sample of the last food that the animal fed on should accompany the other specimens.

(3) Nothing whatever should be added to the specimens, and this injunction applies to water as well as preservatives of all kinds. Samples should be forwarded direct to the Laboratory by the quickest method, and, if necessary, the containers may be packed in ice or otherwise transported in cold storage during hot weather.

(4) In the case of small animals such as bees and birds, a quantity or number of entire carcasses should be sent. In large animals the material forwarded should include the whole or a considerable portion of the stomach and its contents, or in the case of small ruminants (sheep, goats, &c.), of the rumen (paunch), omasum, abomasum, and their contents packed separately and labelled, together with the entire liver and spleen. In the case of large ruminants (cattle beasts, deer, &c.) portions only of ingesta and liver may be sent.

The person taking samples should try to visualize the difficulties of the analyst where five or six portions of the ingesta may have to be used by different methods applied in searching for different poisons. Hence small quantities such as a cupful of ingesta are insufficient to ensure a positive result being obtained. Analysis of animal organs for poison is one of the most expensive investigations the chemist has to perform, as it involves detailing a highly salaried officer for this work alone, and the use of much alcohol and other highly priced chemicals in the operations involved. All care should therefore be taken to supply the analyst with adequate samples in order that failure to obtain a positive result may not bring blame on those taking the samples. Farmers, if possible, should always consult the local officer of the Live-stock Division available, whether he be Veterinarian or Stock Inspector,

before sending in any samples of the above nature. The Government analysts undertake the duty of analysing animal specimens only when it is distinctly in the public interest that such work should be undertaken, and the person who can best interpret what is in the public interest is the local officer of the Department. The expense of carrying out an investigation of this nature on a dead animal is not lightly to be incurred, as it may easily amount to more than the animal is worth, say, five to fifteen guineas, the analyst having to spend perhaps the best part of a week in the work.

In many cases it may be desirable to take specimens with a view to the elimination of poisoning as a cause of death, the idea being to establish the presumption of the occurrence of some rapidly occurring disease such as anthrax or swine-fever, in which case the samples must be as carefully taken as if it was suspected that an ordinary poison was the cause of death.

REVIEW.

Manual of the Rusts in United States and Canada, by J. C. ARTHUR, Sc.D., LL.D., Octavo, xv + 438 pp. One map and 487 text figures. Purdue Research Foundation, Lafayette, Indiana, U.S.A.

THE publication of this book climaxes a life-study of the rust fungi by the author, long recognized as the leading authority on this Order. Always progressive—and at times revolutionary—in outlook, Dr. Arthur has been responsible for stimulating to an unusual degree an interest in these complex organisms. The appearance of this work has therefore been anticipated with a much greater degree of enthusiasm than is usual for a scientific treatise. Perusal shows that this interest is justified, for the presentation departs markedly from that customary in taxonomic publications. The "Manual" covers all rust fungi known to occur in the United States, Alaska, Aleutian Islands, Canada, Newfoundland, and Greenland. Descriptions are given of some 737 species and form-species, and 67 varieties, which are placed in 32 genera and 5 form-genera grouped under the families *Melampsoraceae* and *Pucciniaceae*. These are masterpieces of condensation, the taxonomic details necessary for identification being covered in a few lines. Accompanying the descriptions are details of host range, relevant synonymy, cultures (where undertaken), and distribution. Workable keys are given as aids to identification of the genera and species. The taxonomic part of the book is prefaced by tables of abbreviations, a list of specialists who have studied the rust fungi, and a half-page glossary; and followed by admirable host and fungous indices. A feature of the work is the 487 line drawings (executed by G. B. Cummins) illustrating the taxonomic details of the spores. The "life-cycle" classification used by the author in *North American Flora*, Vol. 7, has been replaced by a morphological arrangement. As a result the taxonomic treatment of the order has been simplified, many well-known generic names reinstated, and dozens erected under the former treatment consigned to synonymic oblivion.

Our criticisms of the book are threefold: First, the International Rules of Botanical Nomenclature have not been followed, with the result that many invalid names are used. Secondly, the terminology employed necessitates an Arthurian glossary. Such, unfortunately, has not been supplied in the "Manual"; consequently many parts are unintelligible unless read in conjunction with a previous publication ("Plant Rusts") issued in 1929 by Dr. Arthur and his colleagues. Thirdly, confusion must follow his grouping of *Uromyces* under *Puccinia*. Both are undoubtedly correlated, but are as distinct morphological entities, nevertheless, as any two rust genera, and certainly more so than many—*e.g.*, *Physopella*, *Cumminsiella*, *Nyssopsora*, &c.—erected by Dr. Arthur. We fear that by European workers this treatment will be regarded as "distinctly American" and suffer in consequence the same fate as the now defunct "life-cycle" classification.—G. H. C.

WHEAT VARIETIES, HARVEST OF 1934.

THE figures appearing in the following table were compiled from monthly returns furnished by proprietors of threshing-machines up to the end of August, 1934. The total area accounted for in this manner was 256,069 acres, out of a total area of 286,271 acres of wheat threshed, according to the annual collection of agricultural and pastoral statistics carried out by the police on behalf of the Census and Statistics Office.

Of the three classes in which wheat varieties are grouped, Tuscan easily occupies first place with 74·96 per cent. of the total area threshed. The Hunters group follows with 17·08 per cent. of the area threshed, while Pearl accounts for the balance of 7·96 per cent. of the total area.

In the Tuscan group the variety Red Marvel shows up very poorly for average yield compared with other varieties in that group. The figures do not, however, give a true indication of the merits or demerits of this variety, as the bulk of it was grown in Nelson Land District. It will be remembered that a severe and prolonged drought was experienced last season in the Nelson and Marlborough districts, and crops suffered accordingly.

The same explanation applies in the cases of Major and Federation wheat respectively shown in the Hunters group. The greater portion of the former was located in Nelson Land District, while the latter was confined principally to Marlborough Land District. Under normal circumstances, larger yields would doubtless have been realized.

Variety of Wheat threshed.	Area threshed.	Total Yield.	Average Yield per Acre.	Per Cent. of Total Area.	Percentage of Total Yield.
	Acres.	Bushels.	Bushels.		
Tuscan—					
Solid-straw Tuscan	180,034	5,837,771	32·43	70·31	68·28
Dreadnought	5,812	239,054	41·13	2·27	2·80
Montana King	1,677	54,830	32·71	0·65	0·64
Hollow-straw Tuscan ..	1,340	46,948	35·02	0·52	0·55
Velvet Ear	1,344	35,202	26·19	0·53	0·41
Sensation	714	26,612	37·27	0·28	0·31
Victor	327	14,213	43·46	0·13	0·17
Red Marvel	257	5,118	19·95	0·10	0·06
Other Tuscan varieties ..	443	13,942	31·47	0·17	0·16
Totals	191,948	6,273,690	32·68	74·96	73·38
Hunters—					
Hunters and College Hunters	30,252	1,163,804	38·47	11·81	13·61
Red Chaff	7,414	266,827	35·99	2·90	3·12
Bell's Hunters	1,844	80,983	43·93	0·72	0·94
Major	1,820	49,464	27·18	0·71	0·58
Federation	1,514	42,910	28·33	0·59	0·50
Yeoman	741	27,943	37·71	0·29	0·33
Other Hunters varieties ..	145	6,462	44·41	0·06	0·08
Totals	43,730	1,638,483	37·47	17·08	19·16
Pearl—					
Jumbuck	13,367	420,020	31·42	5·22	4·91
Velvet	3,129	106,353	33·99	1·22	1·24
Garnet	1,637	49,695	30·35	0·64	0·58
Marquis	1,475	35,372	23·98	0·58	0·41
Pearl	781	26,316	33·70	0·30	0·31
Other Pearl varieties ..	2	88	44·00	0·00	0·01
Totals	20,391	637,844	31·28	7·96	7·46
Totals, all varieties	256,069	8,550,017	33·39	100·00	100·00

—*Census and Statistics Office.*

SEASONAL NOTES.

THE FARM.

Some Phases of Summer Pasture Management.

One of the most important conceptions bearing on the summer handling of pastures utilized for the heavy or rapid production of meat or milk is that waving fields of grass are indicative almost invariably of a weakness in the grazing management—such fields are associated as a rule with the steminess that marks the passage of the pasture from yielding the "concentrate" class of feed to yielding the less-valuable "roughage" class of feed. The change in type of yield is of basic importance, because the roughage is likely to fall below the needs of the stock in respect both to its digestibility and its content of nutriment. This explains the somewhat paradoxical position that at times arises—firstly, when dairy stock which are "up to their knees in feed" fall off in yield at an unnaturally rapid rate, and again when fattening lambs are hampered not by the shortage but by the over-abundance of growth—of a sort quite unsuited to their needs when finishing off.

Another associated conception relates to the seasonal distribution of production. Briefly this is: Any given supply of feed produced fairly evenly throughout the year, as a rule, is of decidedly more value than would be the same supply of feed produced principally in but a few months of the year. And, as a corollary, a ton of high-quality feed produced when there is a shortage of such feed is of more practical value than a ton of similar feed produced when there is abundance of it. For example, a ton of leafy feed in February, when there is often a shortage of it, is likely to be of more practical value, although it has the same nutritive value, as a ton of similar feed in October or November, when there is abundance of such feed.

From this it follows that while the amount of production and the unit cost of production of feed on grass-farming are of fundamental importance they, by themselves, do not fully indicate the standard of efficiency being attained—the quality as distinct from the quantity of the feed and the season of its production play a considerable part in this.

From the above generalizations there emerge two questions of current practical moment. What can be done to reduce steminess in feed in summer? What practices beget the greatest amount of leafy feed in summer?

In February, mowing of pastures may be advisable to "top" portions of pasture growth which are coarse or producing seed in order to induce freer and more ready development of fresh leafy growth from the base of the topped plants. If there seems a likelihood of dry conditions for any considerable time after such topping it should be carried out at a height which will serve to remove the woody or coarse portions, and at the same time leave lower leafy portions of the sward undisturbed: this makes it advisable to cut at a considerably greater height than is adopted in ordinary mowing. It should be borne in mind that over-defoliation of the sward at this stage, whether by the mower or by grazing stock, may readily be more undesirable than the weakness that judicious removal of stemmy or coarse growth is fitted to correct: a supply of coarse feed, with all its various shortcomings, is unquestionably superior to the lack of feed that may result from close defoliation followed by an extended dry spell. The aim in practice should be the adoption of a suitable middle course which will obviate

both the evils associated with uncontrolled growth and those with excessive defoliation. This calls for removing stemmy growth without so impairing the covering of the ground as to lead to drying-out of the soil, and without so reducing the processes of plant nutrition which vary with the amount of leaf-surface as to make the process of recovery in rate of growth unduly slow.

Apart from its function in the control of pasture growth, topping may be advisable in the case of pastures overrun with large numbers of such shade-creating weeds as spear thistles, docks, fat-hen, and red-shank or willow weed. If such weeds are not checked they are likely to weaken greatly pasture plants in their immediate vicinity and possible to destroy them, and so beget vacant patches on which inferior plants later may become established ; but if they are mown these weeds create much less shade, by which the valuable pasture plants are injured.

Suitable top-dressing, which almost always, if not always, involves the use of phosphatic material, in the latter part of the summer or in early autumn, is also likely to increase leaf-production in a profitable manner. When rainfall is adequate the application of phosphates at this time quickly stimulates growth, while if dry conditions follow the application of the phosphates then beneficial effects largely will be deferred but not lost. In addition, the influence of such top-dressing not only strengthens the winter feed position but also continues during the following spring and summer when the growth will not be so markedly stimulated as if the top-dressing were carried out in winter. In short, a top-dressing of phosphates in the summer or early autumn tends not only to give more leafy feed shortly after its application, but also to bring about a more even rate of growth throughout the year, and thereby make easier the task of keeping the pastures suitably controlled.

Both the topping and the top-dressing described above are together far from sufficient as means of securing satisfactory quality and evenness in the supply of feed from pastures throughout the year. Indeed, they are but auxiliaries to systematic grazing management, which calls for alternate grazing and spelling of pastures along the lines which have been described previously in these notes, and about which information may be obtained from local officers of the Fields Division.

Relation between Top-dressing and Composition of Seed Mixtures.

Increased experience with and knowledge of the role of top-dressing has necessitated, within recent years, a revision of the composition of the pasture-seed mixtures recommended for certain circumstances. For generations prior to this the natural fertility of the soil was a dominant consideration in determining the composition of pasture-seed mixtures. But now in regions of satisfactory rainfall (probably an annual rainfall of 30 in. or more), because of the possibility of employing top-dressing as a handmaid, the initial plant-food supply of the soil is at times not of as much moment relative to the seed mixture as is the top-dressing programme it proves practicable to adopt. In other words, it often proves more profitable to bring the fertility of a soil up to the requirements of a high-class seed mixture by suitable top-dressing than to utilize a seed mixture with requirements as low as the natural, unimproved fertility of the soil. In illustration of this, in good rainfall districts, land which naturally gives satisfactory support only to pastures in which brown-top is dominant has been sown successfully in mixtures giving swards in which perennial rye-grass, cocksfoot, and clovers are thriving in consequence of judicious top-dressing. Because of such results seed mixtures which for long were accepted as suitable have been discarded or amended to reflect the role that top-dressing may play in certain circumstances.

Avoidance of some Causes of Poor Results in Sowing down.

The preparation of the ground for the autumn sowing of pastures is an important summer task which should be commenced early enough to avoid unduly late sowing or loose lumpy seed-beds, both of which, even from really good seed, beget unsatisfactory "strikes," especially in the case of clovers.

In districts in which the ravages of the grass grub may be serious it is inadvisable to sow pastures after a cereal or a crop of grass—the eggs from which the grass grubs are hatched are laid near the base of plants mostly in the period from November to January, and the more bare of plants the land is during this period the more likely is it to be free of grubs during the following year.

Some of the causes of poor results in the establishment of permanent pastures were discussed at some length in last month's notes, portions of which are of timely interest.

Seasonable Work in Crop Production.

All crops sown in rows wide enough apart to allow of it usually respond profitably to intertillage as long as it is possible to work between the rows without any considerable injury to the foliage. It cannot safely be said definitely how often such intertillage should be carried out—it serves not only to suppress weeds, but also to conserve the moisture in the soil through the action of a loose surface layer of soil. On certain soils, if intertillage is followed by a heavy beating rain, then the resultant caking of the surface may make the intertillage again desirable to maintain a continuously loose surface.

If the prospective supply of feed for periods of scant grazing is not satisfactory valuable work in forage production can be carried out during the coming few weeks. In many localities there is still time to sow turnips. Green Globe generally proves suitable for sowing at this time; swedes are less satisfactory for late sowing, this being partly because of greater possibility of serious ravages of insect pests especially under dry conditions.

In many instances there becomes available vacant land on which specially useful forage crops may be grown. For instance, following oats good results may often be obtained by sowing Italian or Western Wolths rye-grass and red clover—a crop which will provide autumn and winter feed. Black barley sown at the rate of 2½ bushels an acre may be expected to develop rapidly enough, under normally favourable conditions, to provide useful feed for dairy cows or sheep in about eight weeks. Often it can be sown suitably immediately after oats, and if sown in February provides feed at a time when it is frequently desired. Algerian oats are very useful for later use. With all these crops it is usually profitable to apply from 1 cwt. to 2 cwt. an acre of superphosphate.

Young lucerne which was sown in November or December is often fit for mowing in February. It is not desirable to be in a hurry in carrying out this mowing, however, unless fresh shoots are developing from the bases of the lucerne plants or weeds are tending to "choke" them, for the early stage of the lucerne can be spent more usefully in building up sturdiness and an extensive root system than in renewing foliage. Many successful stands of lucerne are top-dressed regularly with phosphates in summer. The benefit of such top-dressing is, for some time at least, received exclusively or almost so by the lucerne, whereas the benefit of spring top-dressing may be shared by the lucerne with plants such as rye-grass, which, as weeds in the lucerne, it is desirable to suppress.

The Utilization of Crops.

In the North Island farmers engaged in the production of fat lambs usually put out the rams at the end of February or in early March. If the ewes are likely to be too fat they should be put on short rations early enough to have reduced their condition sufficiently. Investigations have shown that the highest numbers of lambs are secured when ewes are in moderately good condition which is improving at the time of mating, and in this connection flushing the ewes for about ten days before the rams go out is of known value. Flushing can be effected by providing some succulent feed such as fresh, short, leafy pastures or rape after the first feeding-off of the lambs. It is possible to obtain the benefit of flushing of ewes that are becoming too fat by keeping them on suitably inferior rations up to within about a fortnight of putting them to the ram, when flushing as mentioned above may be carried out.'

Even in the most favoured districts February feeding is often a critical phase of the work of the year in dairying. It has been observed that when good feeding is practised in February the rate of decline in production is not dissimilar from that of January, but often it is more than twice as great as that of January, and investigation has disclosed that the cause of this normally is faulty feeding. Sometimes, especially in an unfavourable season, the feed in February is deficient in quantity, but more often the deficiency is in quality: the feed may be suitable for maintaining or even for fattening stock, but not of the quality required for the best production from reasonably good dairy cows, and the better the herd the more will its production suffer from such feed. Feeding suitable for maintenance or fattening rather than for butterfat production results when stock are fed on pasture that is stemmy and mature, or on overmature special crops such as green maize or millet, or on silage made from grass that was mown at the stage when hay crops generally are mown. The development of flower-stalks on any of the crops mentioned indicates that the crop is beyond the best stage for feeding for the production of butterfat.

One of the principal means of avoiding faulty February feeding in dairying is the keeping of the pastures leafy. This often is far from easy in practice, and when it cannot be done satisfactorily help should be sought from other practices—*e.g.*, the feeding of soft turnips, of young millet, of succulent lucerne, or red clover, and the leafy aftermath on pastures utilized for early ensilage. At times there may be an inclination to defer the feeding of turnips and of green cereal crops until a greater yield has been obtained, and because of this it should not be overlooked that yield alone does not determine the cash returns from a special forage crop. For instance, a soft turnip crop of 15 tons an acre used during the critical February period may eventually give a greater cash return than a crop of 25 tons an acre available when there are ample supplies of other feed. The explanation of this lies in the fact that from an unnaturally heavy decline in production in February a herd normally does not recover completely for the remainder of the producing season, so that such a decline affects the returns not merely of February, but of several other months.

Some Aspects of Weed Control.

Summer, the season in which the trouble caused by weeds is particularly obvious, is also the season in which attention can usefully be given to the planning of measures which will assist in bringing about better control of many serious weeds. To fit its peculiar conditions, especially economic and labour ones, New Zealand farming has evolved means of weed-control that depart in important respects from the measures that are often followed in some other countries. For instance, apart from some notable exceptions, weeds are not often dealt with, on a farm scale, by methods of direct attack such as hand-pulling, summer fallowing, and spraying, which received

prominence in advice tendered to farmers in other countries. On the contrary, New Zealand farmers quite frequently with success adopt an indirect type of attack which often is based on the conception of adjusting interaction between crops or crops and stock on the one hand and weeds on the other hand in such a way that the crops are not seriously affected by the weeds. In this, much valuable use is made of the principle of controlling the light-supply. Plants, whether they be crops or weeds, need a full supply of direct sunlight to enable the food-manufacturing processes which govern growth to go on in a satisfactory manner. Frequently the injurious effect of weeds is due not so much to depriving the crop of plant-food materials and of moisture, though this is important, as to cutting off the supply of light at the very period of growth, when light-supply is of most importance. Often it is possible to proceed successfully on the principle of turning this fact against the weeds by enabling the crop to win in the race for direct light.

The classical instance of the application of this principle is the growing of special " smother " crops—crops which grow quickly and densely, such as oats and vetches, or oats and Italian rye-grass, or Italian rye-grass and clover : smother crops of this type, assisted by a preceding period of summer tillage, exerts a considerable weakening influence on perennial twitchy weeds such as sorrel, couch-grass, creeping fog, yarrow, and brown-top. If after treatment of this sort such weeds are still troublesome they can be further weakened by growing a well-nourished, well-tended, dense forage crop, such as chou moellier, rape, or mangels, which by its further smothering influence tends to reduce the weeds to impotence. In view of the value that at times has been attached to bare summer fallowing, it is to be noted that in the above practice summer tillage instead of being the main means of dealing with twitchy weeds is merely an auxiliary to a judicious series of crops. It is now realized that, while summer fallow may at times eradicate twitchy weeds, it requires so much labour that it is too expensive, and, further, that under many conditions, especially where the summer rainfall is satisfactory for general farming, no matter how much labour were devoted to summer fallow, by itself it would not be effective. In short, summer cultivation, while far from valueless in the destruction of weeds, can, as a rule, be employed effectively only when linked with crop-management that begets a prolonged and dense shading of the twitchy weeds.

The principle of controlling the light-supply may also usefully be employed when planning the future cropping of land, especially in the South Island, which is known to be infested with the seeds of weeds which germinate in the spring rather than at other times—*e.g.*, fat-hen, spurrey, nightshade. Cropping should be arranged so that such land will be sown in the autumn, with the result that the crop is advanced enough to compete successfully for light against weeds germinating in the spring.

Although trouble from such weeds can be avoided in this manner for one season, the land does not thereby become free from the seeds of the weeds, many of which remain viable in the soil for years, and so it is often advisable to put land heavily infested with such weeds in pasture and to keep it in pasture, especially if the pasture is a satisfactory one, as long as it is practicable to do so.

Another application of the principle of controlling the light-supply is of value against several serious weeds of pastures. The experience of several farmers in the controlling of rushes illustrates this aptly. In these cases in which the presence of the rushes has not been due essentially to bad drainage the farmers begin the attack by mowing the rushes about or shortly after midsummer, when the mowing seems to cause the greatest setback to the rushes. Subsequently the conditions are made so favourable to the growth of grass, by judicious top-dressing, harrowing, &c., that the grass

gradually "smothers" the weeds to such an extent that they become of no practical consequence even though they may not be eradicated. The same type of control is also applied to brown-top, sorrel, &c. An essential of success in this type of weed-control is an initial pasture which will respond satisfactorily to good treatment, and thereby develop eventually into the strong sward with vigour enough to outgrow the weeds. If the pasture is too open or weedy to allow of satisfactory strengthening, then normally the best course on arable land is to plough it up and resow in suitable permanent species.

From the above statements it becomes evident that two outstanding features of economic weed-control in New Zealand are (1) indirect attack based on the principle of controlling light-supply, (2) the adoption of methods which "pay as they go." Unfortunately the control of all weeds does not conform to the application of these conceptions, which, however, could be exploited more extensively with advantage.

—R. P. Connell, Fields Division, Palmerston North.

THE ORCHARD.

Seasonable Spraying.

THE last application for the season of the combination spray for the control of chewing insects and fungous diseases on pome fruit-trees needs to be made much later in some seasons than in others. In certain districts, and when weather conditions are favourable, an application made at the end of January will often effect a satisfactory control for the remainder of the season. However, when there is sufficient rainfall in February or early March to wash an appreciable amount of the spray residue from the fruit, or when damp humid conditions are experienced during this period, it becomes necessary to make one or two further applications later in the season. During the season just past there was, in certain districts, considerable rainfall in February, which produced ample evidence in the form of black-spot, codling moth and leaf-roller injury, &c., that further applications of the usual combination spray could profitably have been applied in late February.

Picking Fruit.

The utmost care in picking is essential if the fruit is to be marketed in the best possible condition. Unfortunately, this phase of orchard work is sometimes left to inexperienced pickers, without proper supervision, resulting in much of the fruit being injured. In fact, it is suggested that more damage is done to the crop in picking than in any other single operation. Complaints are frequently made regarding faulty grading-machines, careless or inefficient packers, lack of care in operating the lidding-press, rough handling in transit to market, &c., and no doubt in many instances there is need for improvement in these operations; but if the fruit is injured in picking no degree of after-care will place it on the market in perfect condition.

The bumping of the picking bag against the ladder or limbs of the tree and the careless emptying of the bags into the field boxes probably account for most damage during picking. Other faults that only too frequently occur are pulling the stem out of the fruit, dropping fruit on to the ground—often caused by trying to pick a second fruit when one is already held in the hand, dropping fruits into the picking-bag and the overfilling of the field-boxes. All of these operations require constant supervision, even when experienced pickers are engaged in the work. If

the orchard-owner (or manager) is unable at any time to remain with the pickers, then a competent foreman should immediately take over the supervision.

Maturity of Pome Fruits.

To determine the degree of maturity fit for picking in apples and pears requires an intimate knowledge of the varieties and expert judgment on the part of the pickers. The first picking of the season from any variety is wherein the most difficulty obtains. Some of the methods in use for ascertaining the right stage of maturity for picking are: The iodine test, which for various reasons cannot be recommended. Likewise the mechanical pressure test is equally unsuitable for general field-work. The colour chart method has a limited use; on the colour chart are three disks—leaf-green, green-yellow, and chalcedony yellow. These colours are reported to correspond with the ground-colour of an immature, just mature, and overmature Jonathan apple. Each colour disk is perforated with a large hole, and to determine its maturity the apple in question is pressed against the hole and the ground-colour matched. While this chart may be of some value for certain varieties, it is obvious that many other varieties would require different colour charts. The colour of the pips is a definite indication in some instances, but as the amount of browning necessary to indicate the degree of maturity necessary varies with most of our principal varieties, no colour standard can be set for all or even most varieties.

Another method sometimes employed with apples is to cut the fruit with a knife—if the sap follows the cut the apple is deemed to be mature. On the other hand, if the cut remains dry, the apple is considered immature. The usefulness of this method is very limited on account of the variation in the different varieties.

It is suggested that the two most dependable guides in this direction are the changing of the ground-colour and the freedom with which the fruit is separated from the spur. In the case of the former an intimate knowledge of the variety as regards ground-colour changes is necessary to select the just-mature fruits at a glance, yet with experience this can be done fairly accurately. With pears the latter method is more simple and fairly dependable, although no doubt with both apples and pears pickers should give due consideration to both ground colour and freedom of release.

Red-mite.

There are at least two species of red-mite common on apple-trees in this country. The more common of these two is commonly known as the European red-mite, and the other, clover-mite. A brief account of the life-history of the former, as worked out in New Zealand, is quoted to enable growers to better understand the importance of spraying at the periods recommended in these notes for December last.

The winter eggs hatch in September and October. The approximate period from hatching to adult occupies, in the female 12·5 days, and in the male 11·7 days. The pre-oviposition period is 3·5 days. The average number of eggs laid by each female is approximately sixteen; average length of life of female, 17·6 days at least. Laying of winter eggs takes place from the end of January into April. The winter egg appears to be different fundamentally from the summer egg, and the former is laid by a special generation which lays this type only. The incubation period of the summer eggs is, on the average, 11·7 days. It is possible for eight generations in a season, but it appears more probable that four or five generations would occur under average orchard conditions.

From a study of the above, it is evident that it is of the utmost importance to prevent the laying of overwintering eggs, as all of these eggs cannot be killed by the application of winter oil, even at a dilution of 1–9. The

application of summer oil destroys the mites, but does not prevent many of the summer eggs from hatching. As the mites commence to lay winter eggs from about the end of January, it follows that this is a suitable time to make the first application of summer oil. The period from hatching to adult being, on an average, about twelve days, it is evident that the second application should be made about ten days after the first, thus preventing the mites reaching the adult stage and laying winter eggs. Where this practice is carried out thoroughly, there should be extremely few winter eggs to commence the infection the following spring.

Manuring Cover Crops.

No matter what cover crop is being grown, the application of some fertilizer at the time of sowing the seed is advisable. For leguminous crops, superphosphate at the rate of 2 cwt. to 3 cwt. per acre is suitable for this purpose and considerably increases the growth.

—P. Everett, Orchard Instructor, Gisborne.

Citrus Notes.

With the continuance of dry weather trees will be retarded and possibly suffer a loss of foliage. This should bring home to growers the necessity of making provision for periods of dry weather. The first essential is a system of thorough cultivation from the early spring onwards, and if this has been neglected doubtless the trees will be suffering. It is very difficult to outline a definite system of cultivation that would meet all seasonal conditions; nevertheless, growers who have had years of experience should have sufficient knowledge as to what should be done in order to obtain the best results.

It is advisable to carry out all seasonal operations as they become due, paying attention to spraying, pinching, &c., that may be necessary from time to time, and that have been described in previous notes.

—L. Paynter, Orchard Instructor, Auckland.

POULTRY-KEEPING.

Cleaning the Quarters.

It may be well to emphasize again the great importance of thoroughly cleaning the quarters where adult stock have been accommodated and the young pullets are to take their place. There are few houses where old birds have been kept which are quite free from vermin, and it is only placing the pullets at a great disadvantage to introduce them to lice-infested quarters. Because vermin cannot be seen in the house during the day, it does not necessarily mean that they are not present. The most dangerous of parasitic pests which affect poultry torture the birds by sucking the blood of the birds at night, harbouring by day in the cracks and crevices of the house. A good means of thoroughly cleaning out vermin and destroying the germs of disease which may lurk in cracks and crevices is to first give the whole of the interior of the houses a good coating of tar, which, when thoroughly dry, should be followed by an application of white-wash. This will have the effect of covering up all hiding-places for the vermin, so that when the spraying with a disinfectant takes place this may be thoroughly effective. Spraying with disinfectants is often condemned as not being sufficiently strong to effectively destroy vermin. This is not necessarily the case, as too often the spraying materials are strong enough, but the trouble is they do not reach many of the crevices and cracks where the insects swarm most thickly. Some seem to think that by giving a house a rest for a few weeks the vermin are destroyed by starvation. This is a great mistake, for the writer has seen a house which had not had a fowl

in it for many months badly infested with red-mite, and this during a cold winter season in Otago. It may be mentioned that when gorged with the blood of the fowl the mite has a deep red appearance, but when fowls are not present it is grey in colour. Obviously lice are a constant drain on a fowl's vitality, and when these pests are numerous a bird is prevented from resting in comfort at night, and in addition, with its life blood being drawn away from it nightly, is unable to make the best use of the food it consumes. It is comparatively easy, by observing proper cleanliness, avoiding overcrowding, and having well-ventilated houses, to prevent red-mite from ever making an appearance in the poultry-house. Only those who have had experience in combating the pest when it has gained a good foot-hold can realize how much better it is to prevent than to wait until it becomes necessary to cure.

Ovarian Disorders.

Judging from complaints received, the desire to secure a big egg-yield has led several poultry-keepers to overforce their birds with boiled meat, meat-meal, &c., and ovarian troubles, such as protrusion of the oviduct, are a natural consequence. A liberal supply of nitrogenous material is essential to heavy egg-production, especially during the colder months of the year, but there is a danger that this may be carried to excess during the spring and summer months, which are the natural breeding-season for bird-life. The rich forcing foods, such as meat or its substitutes, should therefore be fed with caution at this period of the year, especially where the birds have a free range, and thus have an opportunity, especially after rain, of picking up much animal food in the form of worms, &c. Not only does an excessive supply of a forcing ration tend to bring on ovarian disorders, but it induces the production of thin-shelled and double-yolked eggs, and also those containing blood-spots. The chief danger in feeding a heavy meat ration is where this material is mixed with the morning mash, and the latter is fed to all members of the flock irrespective of their age and whether or not they are in a laying condition. The oversupply of meat food is specially accentuated where the supply of grain material is not as liberal as it should be, which often happens owing to the poultry-keeper's incorrect reasoning that an extra supply of concentrated meat food will make up for the inadequate supply of grain. It will usually be found a wise course, especially where a large flock of birds is concerned, to feed highly nitrogenous material such as meat-meal sparingly in the morning mash, but there is no objection to its being always available for the birds to pick at in a separate hopper. In this way ovarian disorders will be reduced to a minimum, as the bird is given an opportunity of balancing its own ration according to nature's dictates, and she can usually be relied upon to do this better than we can do it for her. Usually, when a bird becomes affected with protrusion of the oviduct, hæmorrhage to a greater or lesser extent sets in, with the result that the other birds in the flock will pick at the bleeding part and often pull out the bowels and oviduct of the victim, causing a cruel death. Protrusion of the oviduct in a bird resulting from the feeding of a highly forcing ration and the other birds picking a the affected parts is not necessarily responsible for this part of the bird's anatomy being injured. It is frequently due to one or more birds in the flock acquiring the cannibalistic habit of picking at and puncturing the oviduct just when their mate is in the act of expelling her egg. As a result bleeding sets in, and once the latter makes its appearance and after the bird leaves the nest it is soon attacked by its mates, which usually results in death, and, as is the case with protrusion of the oviduct, dead birds may be frequently found in a house where other members of the flock have pulled out and eaten the greater part of the oviduct and intestines. When a bird is on the point of expelling an egg, the body is raised and the oviduct protrudes more or less, and presents a highly flesh-coloured appearance. The latter condition

no doubt induces the culprit in its desire for animal food to pick at and puncture this delicate organ. Where birds have acquired this vice, the only course is to deepen the nests and arrange them in such a way that the oviduct of a bird cannot be seen or picked at when in the act of laying. Careful observation will often locate the culprit, which is frequently seen standing at the front of the nest-boxes waiting for an opportunity to satisfy its cannibalistic inclinations. It goes without saying that such a bird, if detected, should be immediately got rid of, as it is surprising how soon one bird will teach its mates the habit.

Referring again to vent-picking, it may be well to mention that such is often the result of a hen picking at the vent of another bird when the latter is in the act of excreting. This trouble is most common when birds become constipated as a result of being insufficiently supplied with green food, or with green material that has reached a decidedly fibrous stage. In such cases when the bird is excreting the anus protrudes and the red-coloured flesh thereof attracts the culprit. This is a very bad habit, which causes much mortality, especially among pullets when commencing to lay. Succulent green material fed in abundance and a hopper of meat-meal placed within reach of the birds at all times to pick at will do much to check this habit.

Generally, when ovarian disorders or vent-picking takes place in a laying flock, the owner assuming that the diet provided is of too rich a nature and is responsible for the trouble, and as a means of checking it eliminates forcing-foods by degrees from the ration, but in many cases, instead of the trouble being reduced, it is increased. The birds have acquired the vice of picking each other, and, being in a productive condition, they naturally crave for animal food and pick at the vents of their mates in their endeavour to secure it. The worst cases of this kind that have come under my notice have been where flocks of pullets gave evidence of coming to lay at too early an age and, as a means of checking this, all forcing food was suddenly withdrawn from the ration. True, a heavy meat or milk ration will encourage early maturity, which is undesirable; but of what avail is it to check this by eliminating all forcing-food from the ration if as a result much mortality takes place due to vent-picking, &c.

Corns.

It is sometimes difficult to make people understand that a common cause of birds becoming affected with foot troubles such as corns, &c., lies in having the perches too high. It is contended that in a state of nature a bird will fly into trees and come down again without injuring the feet. The fact is overlooked that out in the open a bird can spread itself in a natural manner, and is therefore able to land gently on the ground, running as it alights to break the force of the landing. In the fowlhouse, on the other hand, the bird loses all the advantages of its wings in its descent and thereby jumps to the ground, the whole weight of the body having to be borne by the legs. Especially does this apply when the one wing has been cut to prevent it getting out of the run. The heavy landing of birds compelled to jump down from a perch to the hard floor is not only a frequent cause of disorders of the feet, especially corns, but is obviously not to the advantage of the high-type layer in the flush of her laying period. Furthermore, a breeding-pen rooster that has contracted corns is generally of little use. High perches are not always responsible for corns on the feet. They are sometimes caused by compelling the birds to exercise on hard or stony runs, or by a prick from a thorn when the birds are on free range, or when thistles, pieces of gorse, &c., have been among the litter used in the houses.

—F. C. Brown, Chief Poultry Instructor, Wellington.

THE APIARY.

Extracting.

EXTRACTING should now be in full swing in all districts of the Dominion. Where operations for any reason have been delayed, care must be taken to see that the bees are not crowded out or they will commence to loaf, and the ultimate crop will be small. It is a good policy to extract twice during the season; but where the beekeeper prefers to leave the work until the end of the flow a close watch should be kept so as to provide ample room. This, however, can only be done where large numbers of spare combs are on hand. It is during the season when honey is coming in freely that the beekeeper realizes that his most valuable asset, next to his bees, is a good stock of extracting-combs. Every effort should be made to get at least twenty spare combs for each hive in the apiary, and with this number always on hand the bees are not likely to be hampered for room.

In the absence of plenty of drawn-out combs the best plan is to keep the extractor going, and thus prevent the bees from blocking the brood-combs. The blocking usually happens unless ample room is provided, and as a result the queens are prevented from laying to their utmost, and the colonies dwindle. At no time during the working-season should the work of the queen be hindered. Care must always be taken to see to this important item during the flow. The honey is quite ready for extraction when the combs are three parts capped, but great care must be exercised not to extract unripe honey. Numerous instances have come under my notice where the practice of taking unripe honey has meant a total loss to the beekeeper.

Strainers.

It is not uncommon to find exposed for sale honey with which proper care and attention have not been paid to straining at the time of extracting. Nothing hinders the sale of extracted honey so much as a layer of wax-particles, dead bees, &c., and it is surprising how few beekeepers take the necessary trouble to see that their product reaches the customer free from impurities. In no case should honey be run direct from the extractor into the containers: it should be properly strained. It is the attention paid to this necessary detail that aids in the sale of the crop, and when honey is properly treated it readily commands a higher price. Fine-gauge wire strainers are usually adopted, but even these are not sufficient to remove the smaller wax particles. In order to ensure perfect condition, the honey should be passed through good fine cheesecloth before being run into the tank. Cheesecloth strainers are excellent, cheap, and easily made, while at the same time they can be cleansed readily. They remove everything but the smallest particles of wax, which should be finally disposed of when the honey is skimmed. This latter process is an important one, and should always be carried out before the honey is put up in marketable form.

Testing Honey for Ripeness.

Before tinning-off the honey the apiarist should make sure that it is ripe. Fermentation is sometimes quite a serious problem, and yearly large quantities of honey which were thought to be well ripened at extracting-time ferment, more especially when left over till the weather becomes warm. The bulk of our honey is exported, and a matter of first importance is its condition on arrival at the overseas market. Usually beekeepers experience little difficulty with low-specific-gravity honeys if care is exercised and only well-sealed combs are extracted from. However, to ensure that the honey is up to standard it should be tested with a hydrometer before being run into the tins.

When making the test the contents of the tank should be gently paddled in order that the honey may be of the same consistency

throughout. This operation is of importance, as there is always a risk of variation of the specific gravity of the honey at the bottom and top of the tank. If on testing with a Twaddle's No. 4 hydrometer the instrument does not sink below 84 a well-ripened honey is indicated. This is equal to a specific gravity of 1·42 when the test is made at a temperature of 60° F. As the temperature of honey in summer rarely sinks so low, the test may be taken at from 70° F. to 80° F. by adding one point to the hydrometer reading for each 10 degrees of heat over 60° F. Thus, if the hydrometer sinks to 82 at a temperature of 80° F., it would register 83 if taken at 70° F. and 84 if taken at 60° F. To arrive at the specific gravity multiply the hydrometer reading by 0·005. Thus $84 \times 0{\cdot}005 = 0{\cdot}420$; add 1 for the specific gravity of water and it will equal 1·420. This method is reliable only up to a temperature of 90° F.

Testing Thick Honey.

Sometimes the honey is so dense that the hydrometer will not sink. When such is the case take equal parts by volume (not weight) of honey and water, mix thoroughly, test with a No. 2 Twaddle's hydrometer, and then multiply the result by 2. This will give the same result as if taken with a No. 4 instrument by the direct method. Thus, if the No. 2 instrument sinks into the honey and water to 42, this multiplied by $2 = 84$. Perhaps the quickest and simplest method for testing thick honey is to have a deep glass or beaker on which is a mark to contain about 4 oz. of water. Fill up to the mark with water, then pour it into another vessel; now fill up to the mark with liquid honey, add the water previously measured, and mix thoroughly; then place in it the No. 2 hydrometer, note the number to which it sinks, and multiply by 10; place the decimal point before the result and add 1. Thus, if it registers 43, $43 \times 10 = 430$; place the decimal point before the $430 = 0{\cdot}430$; to this add 1, which is the specific gravity of water, and the result will be 1·430.

—E. A. Earp, Senior Apiary Instructor, Wellington.

HORTICULTURE.

Vegetable Crops.

THE successful production of vegetable crops depends very largely on timely cultivation and weeding during the early stages of growth; therefore crops recently sown or planted should receive light cultivation whenever it is necessary to break up the surface crust to retain moisture and destroy weeds in the rows or between them. The dry weather usually experienced at this time of the year facilitates this work, and every effort should be made to take full advantage of this opportunity of cleaning the land. The crops will make maximum growth in clean ground and mature rapidly as soon as the flush of growth takes place with the coming of autumn rains. This may be rather a trite instruction, but, unfortunately, the neglect of the thorough performance of these operations is a common cause for poor results.

Autumn rains will check some of the insect pests, but, unfortunately, they have little effect on the white butterfly. In most districts cabbage, broccoli, and cauliflower crops will require the protection of the dusting treatment until the plants commence to heart up. It should then be discontinued in favour of an occasional spray, when required, with a salt or soap solution. These solutions are made by dissolving 2 oz. of soap or salt in 1 gallon of water. In some districts the white butterfly pest has been greatly reduced, no doubt as a result of the parasitic insects introduced by the Plant Research Station, but the crops mentioned still need protection. The butterfly practically disappears towards the end of the month of April, which means that egg-laying ceases, and clean crops will

complete their growth without interference; but on infested crops the larvæ, which have considerable resistance to the lower temperatures, will continue their destructive attack until well on into the winter.

The harvesting of potatoes, onions, and other crops should be given prompt attention as soon as they are ripe, especially in warm humid districts where a second growth takes place very rapidly. In dry districts the curing of onions is facilitated, but the potato moth frequently levies a heavy toll under such conditions. Losses from this attack will be prevented if potatoes are bagged up the same day as they are dug and not left exposed for this night-flying moth to lay her eggs upon them. Infected shaws should be burnt, and small potatoes should not be left exposed to carry over the infection. Potatoes in the ground will not become infected if they are moulded up well, unless they are allowed to remain in the ground some time after the tops have died down, when, in the absence of the tops, the moths will seek out any accessible tubers. If these infected potatoes are included when bagging up, the results are generally serious, as the pest continues to increase and flourish for a long period in the shelter of the store.

The problem of maintaining a supply of humus in ground devoted to intensive cropping is very pressing; in the absence of a sufficient supply of farm or stable manure, growing green cover-crops is the main alternative. As a generous supply of humus is a fundamental necessity, land should not be left bare after harvesting, but lightly cultivated and sown down at once with mustard, oats, barley, or beans—any crop that will make rapid growth at the season and during the time the land can be spared for the purpose. In any case the production per acre is decidedly limited as compared with the needs of the land, so that it is usually necessary to take advantage of every opportunity for growing green crops for turning under. It is also an excellent method of smothering out weeds which, we are now beginning to learn, are responsible for many more injurious effects on crops than merely that of competition with which they are generally charged. As hosts for insect pests and many plant-diseases, some of them carry over the trouble from year to year when it would otherwise die out; or they are a source of contagion that is easily overlooked.

As the celery crop approaches maturity it is necessary to blanch the stems by excluding the light; for ordinary varieties this takes about six weeks and about half that time for self-blanching varieties. Where it is grown in trenches on account of dry conditions, the side shoots and dead leaves should be removed, the trenches generously watered, and any nitrate of soda or other manures required should be applied. When the plants are dry they should be lightly tied and soil, well pulverized, should be filled in round them to a depth of 4 in. or 5 in. The moulding-up is completed in two more operations of this kind performed in dry weather at intervals of about a fortnight. For self-blanching varieties grown in blocks on the flat in moist land, it is necessary only to place 12 in. boards on edge close up around the sides of the block to blanch the sticks effectively.

On well-drained soil in a sheltered position crops of cabbage and sometimes cauliflower may be planted out about the month of April for spring cutting. For these crops the seeds are sown during the month of February; spinach and lettuce for winter use may also be sown; and, in the colder localities, tender mild onions of the Rocca or Tripoli class for salads, and planting out in spring; in warmer districts this sowing is usually made towards the end of March.

Cleaning up the Glasshouse.

Scientific research during the last few years has demonstrated the necessity of keeping the glasshouse and soil biologically clean and indicated methods of doing it effectively. The facility with which good crops may be grown in new glasshouses is a matter of fairly common experience and plainly

endorses the need of an annual clean up, especially in houses where the same kind of crop, as tomatoes, is grown for many years in succession. For all operations of this kind results depend on systematic, thorough, well-timed treatments; badly regulated efforts are merely a waste of time and money.

The harvest of the tomato crop under glass being completed, the house is fumigated, during an evening without wind, by closing it tightly and burning sulphur in small heaps on the floor, and leaving the house closed for twenty-four hours. Sulphur is burnt at the rate of 2 lb. per 1,000 cubic feet of space in the house, placing it in five or six heaps to facilitate the distribution of the gas. The stems of the plants are then cut a few inches above the ground, and when they have dried somewhat the tops of the vines are cleared and plants and strings are taken out and burnt, as are the roots after carefully lifting them with a fork. The experience of the past season, and inspection of the roots when lifting them will afford a very good knowledge of the conditions as regards diseases and pests that may be present, and upon that knowledge the further treatment necessary may be decided and carried out while the house is empty and strong remedies may be applied. The house should be cleared of everything movable and swept down as necessary. This will be all the more effective if wall-plates are bevelled and the woodwork is properly painted. Level plates and crevices afford easy lodgment for pests and diseases, so should be avoided as far as possible. Pipe draining may be considered where the land is heavy; there are no doubt instances where a properly installed system would give greatly improved results. Under ordinary conditions a dressing of naphthalene, 4 oz. per square yard, thoroughly dug in and a cover crop sown down a week or two later will meet the position. Every few years the soil should be removed to a depth of 12 in. and replaced with good fresh loam or the soil sterilized with steam. There are indications that steaming the soil annually is an unnecessary expense and decidedly injurious. Where there are a number of houses, one or two may be treated each year so that each will receive this attention about every four years. As sterilization results in the liberation of considerable quantities of plant-food, it is unnecessary to apply organic nitrogen to the soil for the next crop in the houses receiving this treatment. Attention should be given to the vicinity of the glasshouses, frames, and tool shed, as reinfection readily takes place if these are neglected.

Planting Strawberries.

In warm localities in the north planting is done towards the end of autumn with good results, but elsewhere it is generally best to set out the plants in early autumn as soon as the young plants are available so that they are well established before the winter season. Soil suited for this crop is heavy, deeply worked, moist but well drained, and quite free from bad perennial weeds; the situation open but warm. With a heavy dressing of blood and bone manure and superphosphate ploughed under, the plants may be set out with good prospects of a satisfactory crop. As with other kinds of fruiting-plants, varieties satisfactory in one district are often disappointing elsewhere. Those favoured in the North are Marguerite, Captain Cook, and Helenslea Surprise; while in the South, strains of Melba, Laxton's Noble, and Ettersburg are preferred. Good plants are required for the best results; they are of moderate size, well rooted, free from leaf-spot and other diseases, and of good strain; not spoiled by bad packing or kept too long out of the ground. When the surface of the ground is well graded and the soil settled firmly, the plants may be set out about 9 in. apart and 26 in. to 36 in. between the rows; the wider distance where the plantations are cropped for two or three years, especially where the matted row is favoured or horse-drawn implements are used. After planting take advantage of dry intervals to lightly cultivate the ground and destroy seedling weeds.

Laying down Lawns.

The fine lawns and greens that are sometimes seen in this country are frequently the subject of complimentary remarks by visitors from overseas. To a great extent their fine condition is due to the soil and climate which are so conducive to the best results, which, however, cannot be realized unless care and attention are given when laying them down and maintaining them afterwards. As a smooth, close sward is one of the finest features in the garden, a little care in its making and maintenance is well repaid. Those who purpose to sow down a lawn towards the end of February or early March—a most suitable period—may well consider the following points: Cultivate the soil to an even depth and thoroughly pulverize it so that it will consolidate evenly. Take the greatest care to have the surface at a suitable height and smoothly graded so that water will not lie in pools, but will drain off satisfactorily; this probably requires the most consideration and labour to accomplish. Complete the consolidation of the ground, when it is comparatively dry, by rolling it well; and rake up an even, shallow tilth on the surface. In calm weather broadcast the seed at a rate of ½ oz. to 1 oz. to the square yard, and rake it in smoothly. Different kinds of seeds are used in the various districts according to the soil and the purpose of the green, but it is interesting to note the work of the Greenkeeping Research Committee at Palmerston North shows the best turfs have resulted from sowings of a grass-seed mixture consisting of one part brown-top and two or three parts of Chewing's fescue, on good alluvial soil in that locality. In many manurial trials 1 oz. superphosphate and 2 oz. sulphate ammonia per square yard, worked in before seeding the greens, gave excellent results.

—W. C. Hyde, Horticulturist, Wellington.

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WEATHER RECORDS: DECEMBER, 1934.

Dominion Meteorological Office.

NOTES FOR DECEMBER.

DECEMBER was a very dry and sunny month. The effect of the dry weather was accentuated by the very high temperatures ruling, but, on the other hand, was somewhat mitigated by the unusual absence of wind. It was the hottest December ever recorded in New Zealand, and no other month has exhibited so large a difference from its corresponding normal. Pastures have become parched and brown, and fruits and crops have ripened and plants flowered in an immature condition. Root crops have germinated badly in many places. The milk-yield has fallen off considerably, and lambs are not fattening so well as previously. Otherwise stock are in good condition. In North Auckland and at scattered places elsewhere, the general conditions were reversed, and there is still plenty of green pasture.

Rainfall.—The Auckland Peninsula, especially the northern portion, had a very wet month, but in all other major divisions of the country the average rainfall deficiency was large. This was particularly the case from the Wellington Province southwards. Even where heavy falls occurred they were generally of a local character, and less benefit was derived from them than if the rain had been general. In parts of the central plateau of the North Island, in the Opotiki district, and in much of Otago and Southland, conditions were better than elsewhere. The lowest rainfalls were experienced near Wellington, on the Wairau Plains, and in parts of Canterbury. Several places near Wellington, much of Banks Pensinsula, and the Lake Coleridge area recorded none at all.

Temperatures.—The mean temperatures were everywhere much above normal, and most places experienced the hottest December on record. In no other month since recording began has the average departure from normal over the Dominion, whether positive or negative, been so high. In numbers of districts the mean was 7° F. or more above the average. Many high individual temperatures were recorded, but the most noticeable feature was the uniform conditions with persistently high readings. The coldest spell occurred on the 9th and 10th, but minimum temperatures below 50° F. were infrequent in all districts.

Sunshine.—Abundant sunshine was experienced in most places, and several had their highest monthly total on record.

Pressure Systems.—Extremely uniform pressure conditions were experienced, with rather high readings ruling. The outstanding feature of the situation was the almost continuously high pressure to the eastward, as shown by the reports from Chatham Island. At the same time low pressure prevailed over Australia. As a result, the prevailing wind was a north-easterly, and westerlies were conspicuous by their absence. Depressions, which were deep and productive of much rain over eastern Australia and the Tasman Sea, became shallow and lost energy as they approached New Zealand. The anticyclones, except for one in the middle of the month, passed in higher latitudes than usual. There was no really stormy weather, and scarcely a gale was reported.

During the first ten days disturbed weather persisted over the Tasman Sea, a deep cyclone developing in the northern portion. As the remains of this passed by to the north very heavy rain fell in North Auckland, severe floods being experienced in the extreme north.

A shallow depression followed closely on the above, and on the 11th occurred the nearest approach to general rain. As this depression passed eastward also, the barometer at Chatham Island showed the only considerable fall recorded during the month.

RAINFALL FOR DECEMBER AND CALENDAR YEAR, 1934, AT REPRESENTATIVE STATIONS.

	December, 1934.				Calendar Year.	
	Total Fall.	Number of Wet Days.	Maximum Fall.	Average December Rainfall.	Total Rainfall.	Average Rainfall.
	North Island.					
	Inches.		Inches.	Inches.	Inches.	Inches.
Kaitaia	6·92	14	2·90	2·63	6·337	54·31
Russell	10·38	14	4·50	2·55	83·77	49·94
Whangarei	9·77	19	2·82	2·99	68·70	60·51
Auckland	2·38	10	0·86	2·91	43·54	44·87
Hamilton	1·20	4	0·55	3·50	40·26	49·54
Rotorua	2·96	6	1·22	3·73	51·45	54·98
Kawhia	1·36	4	0·58	3·30	44·40	53·72
New Plymouth ..	3·19	13	0·94	4·24	52·18	59·80
Riversdale, Inglewood ..	3·58	11	1·47	7·48	78·79	104·17
Whangamomona ..	5·15	9	1·40	5·63	65·66	77·55
Hawera	1·14	5	0·63	3·25	36·71	45·21
Tairua	2·42	11	0·82	4·37	54·29	64·44
Tauranga	2·27	6	1·07	3·57	52·11	52·37
Maraehako Station, Opotiki	1·04	8	0·45	2·92	43·68	53·37
Gisborne	3·40	9	1·97	2·30	28·38	45·13
Taupo	2·91	13	0·58	3·12	42·47	43·87
Napier	0·82	9	0·33	2·25	26·70	35·02
Hastings	1·00	6	0·44	1·88	23·45	31·86
Whakarara Station ..	2·08	7	0·65	..	45·56	..
Taihape	4·06	7	1·08	3·24	32·11	36·93
Masterton	0·05	2	0·04	2·87	32·13	38·54
Patea	0·93	7	0·45	3·52	38·71	44·81
Wanganui	0·56	3	0·48	2·69	30·94	36·11
Foxton	2·02	1	2·02	2·64	33·38	32·51
Wellington	0·05	1	0·05	2·84	43·34	41·08
	South Island.					
Westport	2·94	7	1·36	8·45	81·88	96·80
Greymouth	1·63	4	0·85	8·65	86·07	101·55
Hokitika	5·22	7	2·11	10·45	89·88	115·24
Ross	4·45	9	1·48	12·05	107·25	135·49
Arthur's Pass ..	0·90	3	0·84	14·11	145·22	161·91
Okuru, South Westland	21·75	9	6·10	10·97	..	144·47
Collingwood	0·71	4	0·59	7·97	87·65	97·40
Nelson	3·40	3	1·63	2·96	38·95	37·84
Spring Creek, Blenheim	0·70	2	0·65	2·10	30·87	30·28
Seddon	0·09	2	0·07	1·96	28·09	24·80
Hanmer Springs ..	1·02	6	0·65	3·88	49·65	45·30
Highfield, Waiau ..	0·47	5	0·30	2·64	34·21	33·28
Gore Bay	0·48	3	0·42	2·57	38·12	31·27
Christchurch	0·04	3	0·02	2·15	26·41	24·99
Timaru	0·66	9	0·28	2·44	25·84	22·64
Lambrook Station, Fairlie	0·98	7	0·36	2·57	29·62	24·87
Benmore Station, Clearburn	0·34	6	0·17	2·34	23·69	24·64
Oamaru	1·47	11	0·61	2·25	24·74	22·01
Queenstown	1·26	7	0·48	2·52	31·59	30·46
Clyde	1·15	7	0·64	1·76	17·11	15·22
Dunedin	1·73	8	0·76	3·52	40·18	36·77
Wendon	1·13	8	0·36	2·82	26·42	29·96
Balclutha	1·50	5	0·80	2·56	30·11	25·62
Invercargill	2·45	14	0·54	4·06	38·96	45·75
Puysegur Point ..	7·64	15	1·68	7·17	73·49	85·26
Half-moon Bay ..	4·08	18	0·80	4·90	47·68	58·79